MODELLING OF OZONE PRODUCTION IN THE SARNIA REGION

APRIL 1989

Environment Ontario

Jim Bradley
Minister

89-05700/

ISBN: 0-7729-5001-6

MODELLING OF OZONE PRODUCTION IN THE SARNIA REGION

Neville Reid and Sonny Wong
Air Resources Branch

ARB-205-88

April 1989

Copyright: Queen's Printer for Ontario, 1989

1. Introduction

Canadian guidelines for ozone specify that the maximum acceptable level is 82 ppb expressed as a one hour average. Ozone concentrations in Southern Ontario frequently exceed this level, and have been a cause of concern for a number of years. It has been established that the atmospheric ozone found in this region results from photochemical production from precursors emitted largely in the Sarnia-Windsor region, superimposed on ozone and/or precursors transported from south of the border (Yap et al., 1987). A field study was carried out in the Sarnia region in 1984 to help understand and quantify the problem (Lusis et al., 1985). The modelling study described in this report is complementary to that field work, and was designed principally to provide an indication as to which of hydrocarbon or NO_x control would be more effective in controlling ozone production in this region.

A model incorporating simplified transport and dispersion, but sophisticated photochemistry was used in this work, and was run for a number of sets of initial conditions. These conditions were based partly on data obtained during the Sarnia Oxidant Study, with other conditions chosen to ensure that a broad, yet reasonable, range was covered.

2. The Ozone Simulation Model

2.1 Model Description

The model used in this work was a simple box model, incorporating sophisticated photochemistry. The chemical mechanism was developed for the Eulerian long range transport model, ADOM, developed for the Ontario Ministry of the Environment, the Atmospheric Environment Service of Environment Canada, and the West German Umwedbundesamt (ERT, 1984). This mechanism may be considered to represent the current state of the art. It has been extensively tested against smog chamber data. The model considers solely the chemical evolution of a specified initial condition, and does not include pollutant emissions or inflow through the boundaries of the model domain. In simulating any given day the modelled time runs from 10 a.m. to 4 p.m.

2.2 Model Validation

The model is highly simplified with respect to the real world, but its limitations were considered to be acceptable in the present study, since the results were only to be used in a relative sense. That is, the important conclusions from the model runs were the magnitude and direction of the changes in ozone concentration produced by changes in the initial conditions. Nevertheless, it was important to ensure that the model reflects reality sufficiently accurately that confidence can be placed in its predictions.

A number of the sets of initial conditions for which simulations were performed were based on measurements made during the Sarnia Oxidant

Study ("real" days; see Section 3). To test the model, its predictions for these days were compared with the maximum ozone concentrations determined on the same days. The results of this comparison are summarised in Table 1, and are presented graphically in Figure 1. The agreement must be considered to be excellent, particularly in light of the simplifications introduced in the model, and the fact that the spatial and temporal resolution of the measurements was not fine enough to ensure that the ozone maximum associated with the Sarnia plume was actually captured.

3. Initial Conditions

A comprehensive set of initial conditions was considered, based on measurements made during the Sarnia Oxidant Study (Lusis et al., 1985). Initially two specific days were selected, corresponding to relatively clean conditions, i.e. low ozone, NO_x and organic compounds, (28 June 1984) and dirty conditions (3 July 1984). A number of perturbations were then applied to these conditions to test the sensitivity of the model predictions. The specific perturbations used were

- a doubling of the NO_x concentration
- an increase of HC by a factor of five
- an increase of HC by a factor of 1.5
- successive reductions of NOx to 50, 28, 20 and 14%
- successive increases of NOx by 33 and 50%
- simultaneous increase of NOx and HC by 50%

In addition model runs were carried out for several other days from the Sarnia Oxidant Study for which reliable measurements were available. The specific days were 7, 8, 14, 16, 17 and 18 July. For 8 July two slightly different sets of initial conditions were used. Five further sets of conditions were then created, identified as A, B, C, D and E. Predicted ozone concentrations are presented in this report for all of these sets of initial conditions, and real day data were used to assess the performance of the model, as described in Section 2.2. However, considerations of the effects of precursor control were limited to the clean and dirty days, for which extensive perturbations of the initial conditions were applied.

The full set of initial conditions is summarised in Table 2. These conditions cover a wide range of concentrations of both NO_x and organic compounds, as is shown in Figure 2. For the purposes of this figure the hydrocarbon concentration on a given day is summarised as

$$HC = 3*\text{propane} + 5*\text{alkanes} + 2*\text{ethene} + 4.5*\text{alkenes} + 7*\text{aromatics}$$

with units of ppbC. The numerical coefficients in the equation above (i.e., 3, 5, etc.) represent the number of carbon atoms in the given chemical. The coefficients are exact for propane and ethene, but are approximations to what might be found for a typical atmospheric mixture of the other groups. Note that this definition specifically excludes oxygen containing species. This

should not be taken to mean that such species are unimportant in the photochemical production of ozone; in fact they are known to be very important. It was simply chosen as a convenient representation for the concentrations of a number of chemical species. The headings in Table 2 serve either to identify the particular day modelled (e.g. Clean Day, A), or to describe how the conditions were derived (e.g. Dirty Day, f*HC indicates that these conditions were obtained by multiplying the dirty day hydrocarbon concentrations by a factor. The specific factors applied are given above).

4. Results

The results for a model run take the form of a print out of species concentrations at hourly intervals between 10 a.m. and 4 p.m. The full results are included as an Appendix to this report. In addition, the maximum ozone concentration, and the time at which it occurred are included in Table 2.

For many of the model runs the time of occurrence of the ozone maximum was 4 p.m., which indicates that the true maximum had not yet been achieved. However, it should be remembered that the model did not treat the process of pollutant emission or dry deposition. Such simplified models have been found to predict ozone concentrations whcih continue to increase into the late afternoon (Davis et al., 1983). If pollutant emission and dry deposition are included in the model the predicted ozone levels are generally found to peak earlier in the afternoon, and then to decrease under the combined effect of scavenging by vehicular emissions of NO and removal by dry deposition. The maximum ozone concentration seen during the model run has therefore been accepted as a reasonable representation of the peak ozone concentration for the day.

Also included in Table 2 are the total NO_x and hydrocarbon concentrations, as well as their ratio, since these quantities have often been considered in analysing the production of atmospheric ozone.

Figure 3 is a plot of the peak ozone concentration against the hydrocarbon to NO_x ratio for all model runs. There is clearly not a one to one correspondence between ozone concentration and the ratio, since a range of ozone concentrations is produced for different sets of initial conditions corresponding to the same value of HC/NO_x. However, it appears that the highest peak ozone concentrations are not observed for high or low values of HC/NO_x, i.e. for HC/NO_x greater than about 20 or less than 5. The relationship between these quantities is explored further in the following sections.

4.1 Dependence of O3 on HC/NO_x

4.1.1 Clean Day and Variations. The plot of peak ozone concentration versus initial HC/NO_x for the clean day, and perturbations of its initial conditions is shown in Figure 4. Note that when changes were made to NO_x the ratio of NO to NO_2 was kept constant. As Figure 4 shows, if the hydrocarbon concentration is held constant, and the NO_x concentration is changed, the

peak ozone concentration passes through a maximum, corresponding approximately to the base case (clean day) conditions. However, if the NO_x is held constant, and the hydrocarbon concentration is increased by factors of 1.5 or 5 the peak ozone concentration is increased. The sensitivity of ozone production to changes in hydrocarbon concentrations appears to be lower than it is to NO_x, since for a 50% increase in both concentrations a decrease in peak ozone concentration is found. That is, the increase brought about by a 50% increase in hydrocarbons is not large enough to offset the decrease produced by the 50% increase in NO_x.

Although the effect of decreasing HC concentrations was not explicitly modelled, it has been shown by others (e.g. CARB, 1986; Chock et al., 1981) that such a decrease leads to lower ozone concentrations. Taking these conclusions together with the results of the present study, it appears that for the clean day conditions ozone could be controlled by controlling either (or both) of NO_x or hydrocarbons, with NO_x control possibly being more effective. The clean day base case appears to correspond to the NO_x concentration which produces the highest peak ozone concentration.

4.1.2 Dirty Day and Variations. Figure 5 shows the plot of peak ozone concentration versus HC/NO_x for the dirty day conditions. Although the predicted ozone concentrations are substantially higher than for the clean day, the dependence on initial conditions is very similar. That is, for both increase and decrease in initial NO_x at constant initial hydrocarbon levels, the peak ozone concentration is predicted to decrease. This is similar to the clean day case, as is the observation of a substantial increase in peak ozone with increasing initial hydrocarbon concentration. What is different in this set of simulations is that if both hydrocarbons and NO_x are increased the peak ozone concentration also increases. That is, for the dirty day the sensitivity of ozone production is higher to hydrocarbon concentration than it is to NO_x. It should be pointed out, however, that a 50% increase in hydrocarbons for the dirty day represents a substantially greater increase in absolute concentration than it does on the clean day, because of the much lower concentrations in the latter case.

This apparent difference in relative sensitivity to HC and NO_x between the clean and dirty initial conditions demonstrates the inherent non-linearity of ozone production. Because of this it is important to note that the quantitative effect of controls will be dependent on the base case conditions to which the controls are applied.

4.1.3 Other Initial Conditions. Fourteen further sets of initial conditions were set for model runs, to allow a good range to be explored. Eight of these corresponded to "real" days during the Sarnia Oxidant Study (Figure 6), the remaining six were chosen to complete the range, and results for this group are shown in Figure 7. In both of these figures there is a suggestion that peak ozone concentration passes through a maximum with increasing HC/NO_x. The behaviour in these cases is different from that of the clean and dirty days because changes in HC/NO_x are accompanied by changes in the hydrocarbon composition, and thus in the reactivity of the hydrocarbon mixture. This question is discussed further in Section 4.3.

4.2 Isopleth Plots

Early modelling of ozone production was based on EKMA (Empirical Kinetic Modelling Approach; e.g. Dodge, 1977), in which a simple chemical model was exercised to construct isopleths of peak ozone concentration as a function of initial NO_x and hydrocarbon concentrations. It is now recognised that the simple model employed in the early work did not adequately reflect the reactivity of the ambient hydrocarbon mixtures encountered in urban areas. This problem is illustrated in Figure 8, which shows a plot of the initial conditions used in our model simulations, by both NO_x and hydrocarbon. The individual points are labelled with the peak ozone concentration observed for that run. It is very clear that ozone isopleths could not easily be drawn through these points as is done in EKMA. The reason, as was mentioned previously, is that the reactivity of the hydrocarbon mixture can vary substantially for apparently similar hydrocarbon concentrations. However, it is generally true that lower ozone concentrations are associated with initial hydrocarbon concentrations of less than 100 ppb.

4.3 Hydrocarbon Reactivity

This modelling study was not specifically designed to assess the effects of hydrocarbon composition or reactivity on ozone production. However some insights may be gained by comparing those sets of conditions which have similar NO_x and hydrocarbon concentrations, but which give rise to different ozone levels. Two groups will be considered, one set labelled A1, A2 and A3 corresponding to clean conditions (runs 3, 18, and 19), and one to generally dirty conditions (labelled B1, B2 and B3 corresponding to runs 2, 20, and 29). Table 3 contains the data for these runs, extracted from Table 2 and grouped to facilitate the comparison.

The only difference between runs A1 and A2 in the first group is in the split between NO and NO_2, being 10 and 3 ppb respectively for A1, and 7.5 and 4.5 for A2. It is clear that an atmosphere containing a greater proportion of NO_2 relative to NO is more reactive, leading to the production of 43.2 ppb of ozone as compared with 38.1 ppb. This appears to be a relatively small increase, but it should be remembered that this amount includes an initial ozone concentration of 30.3 ppb. That is, the higher NO_2 conditions actually give rise to approximately 50% higher ozone production (12.9 ppb compared with 7.8 ppb). The reason for the increased production is probably because NO_2 is fairly readily photolysed to produce an oxygen atom and then an ozone molecule, whereas NO must first be oxidised, generally consuming a molecule of ozone in the process.

If runs A2 and A3 are compared, the difference is seen to be an increase of 50% for A3 in the initial concentrations of alkanes, alkenes, aromatics and carbonyl compounds. This increase leads to a 75% increase in produced ozone (21.75 ppb compared with 12.9 ppb). This is consistent with the increased reactivity for A3 relative to A2, brought about by the increases in formaldehyde, aromatics and alkenes.

In the second group of runs, identical ozone peaks were produced in B1 and B2, in spite of a small increase in both NO and NO_2 in the latter case. Very much less ozone was produced in run B3, 47.2 ppb compared with 121.5 ppb, or in comparing the amount in excess of the initial concentration, 17.2 ppb compared with 41.6 ppb. The factor of 2.5 difference can be attributed to the decrease in initial hydrocarbon concentrations in B3 relative to B1 and B2. The decrease was about 25% overall, but more important was the factor of two or more decrease in formaldehyde, ketones and aromatics, which was sufficient to offset the effect of the increased alkene concentrations in B3.

4.4 Discussion

The main thrust of this modelling project was to determine whether control of NO_x or hydrocarbons in the Sarnia area would lead to control of ozone production, and it is clear from the results obtained that controlling either, or both together would lead to reductions in the amount of ozone produced. It should be noted that the HC/NO_x ratios for the clean and dirty days are 3.4 and 5.3 ppbC/ppb respectively. Previous studies (e.g. Chock et al., 1981; CARB, 1986) have indicated that at these low ratios hydrocarbon control is expected to be beneficial, but NO_x control is expected to lead to higher levels of ozone. This apparent contradiction may be resolved when it is realised that the pollutant concentrations found in the Sarnia area, and treated in this study, are low when compared with those typically encountered in urban areas in the U.S. The difference that this makes is illustrated by the general EKMA isopleth diagram shown in Figure 9. The range of conditions covered by this study lies within the dotted area at the lower left of the figure. Within this region, even for low HC/NO_x, a reduction in NO_x or in HC will lead to a reduction in peak ozone concentrations.

It is beyond the ability of the model used in this study to determine the emissions reduction required to achieve a given ozone concentration, since it treats only initial conditions, and does not explicitly include emissions. However some guidance may be derived from these results, as follows.

Consider Table 4, which contains results extracted from Table 2 for the clean and dirty days, and for these conditions perturbed separately by a 50% decrease in NO_x and a 50% increase in hydrocarbons. Note that the hydrocarbon case is based on an increase, because decreased hydrocarbons were not modelled.

For both clean and dirty conditions 1.4 ppb less ozone is produced for every 1 ppb less NO_x in the initial mixture. However, ozone production on the dirty day is less sensitive to changes in hydrocarbons than it is on the clean day (0.11 ppb/ppbC as opposed to 0.33 ppb/ppbC). The reason for this is that the initial hydrocarbon mixture on the dirty day contains relatively much more of the less reactive alkanes than it does on the clean day. As calculated here each molecule of alkane is assumed to contain 5

carbon atoms. The clean day mixture therefore contains 17 ppbC of alkanes, or 62% of the total, compared with 87 ppbC or 75% of the total on the dirty day.

It is therefore clear that when measured in terms of concentration, as described above, control of NO_x is more effective than is control of hydrocarbons. However, this statement is oversimplified, since it does not take into consideration the importance of the actual initial conditions in determining the magnitude of the effect produced by changing hydrocarbon and/or NO_x concentrations. It also ignores two very important issues, namely the relative costs of controlling hydrocarbons and NO_x, and the fact that control of selected hydrocarbons could be much more effective in controlling ozone than a blanket reduction.

The more likely case, though, is control expressed in percentage terms, e.g. 40% reduction in NO_x or hydrocarbons. When expressed in these terms hydrocarbon control is probably still less effective, as is best seen from Figures 5 and 6, which contain points for 50% change in both species. Specifically, a 50% change in NO_x for the clean day produces a 12% change in ozone concentration, compared with an 8% change if the hydrocarbon concentrations are changed by 50%. For the dirty day the figures are 12% and 6% for 50% change in NO_x and hydrocarbon respectively.

A more fundamental question must also be addressed (although it is not within the terms of reference of this investigation, and will not be answered here). In the model simulations presented here the atmosphere in the Sarnia area has been shown to be capable of generating up to about 65 ppb of ozone. It is very important to remember, however, that this amount is superimposed on the initial concentration, which, at approximately 80 ppb for the dirty day, was already almost at the maximum acceptable level. It is well known that high initial concentrations can be imported into the area from south of the border (Yap et al., 1987; Davis et al., 1986), and that they can exceed the guideline ozone concentration. It therefore follows that total elimination of oxidant forming emissions in southern Ontario would still be ineffective in bringing the problem completely under control. The question to be answered then is whether it is really worth attempting to control these emissions at all, given that compliance with Canadian air quality guidelines may not be achievable under the present conditions.

5. Conclusions and Discussion

The conclusions from this modelling study are summarised below:

1. For two days during the Sarnia Oxidant Study having very different pollutant levels the initial NO_x concentration in the Sarnia area appeared to be optimum for ozone production. That is, the predicted ozone concentration was reduced for an increase or a decrease in NO_x.

2. Conditions relating to several other days of the Sarnia Oxidant Study were also modelled. Generally good agreement was found between predicted and measured peak ozone levels, but the sensitivity of the

results to changes in initial conditions was not investigated.

3. Increasing the initial hydrocarbon concentration led to increased peak ozone concentrations.

4. Ozone concentrations can be reduced by controlling either NO_x or hydrocarbons.

5. On the basis of both concentration change and percentage change control of NO_x appears to be more effective than control of hydrocarbons in reducing ozone concentrations. This conclusion may be dependent on the actual initial conditions.

6. In light of the high concentrations of ozone transported into southern Ontario from the south, it is not clear that emission controls in the Sarnia region would be able to bring about sufficient improvement in ozone levels for guidelines to be met.

In assessing the conclusions of this study it is important to note again the relative simplicitly of certain components of the model. Because pollutant emission is not treated, the model can not be used to develop a detailed ozone control strategy for a given area. However, the chemistry module used in the model is detailed and well validated, so that the general conclusions regarding the dependence of ozone production on initial conditions drawn in this work are valid. These conclusions are applicable to other areas, besides Sarnia, having similar concentrations of hydrocarbons and NO_x since there are no site specific features included in the model.

References

CARB (1986). The Effects of Oxides of Nitrogen on California Air Quality. California Air Resources Board Report No. TSD-85-01

Chock, D.P., Dunker, A.M., Kumar, S., and Sloane C.S. (1981). Effect of NO_x Emission Rates on Smog Formation in the California South Coast Air Basin. Env. Sci. & Technol. 15,933-939.

Davis, C.S., Portelli, R.V., Reid, N.W., Onlock, S.G. and Alp, S. (1983). Social and Economic Impact Analysis on Automobile Emission Standards: Air Quality Assessment. Concord Scientific Corporation Report CSC 110.J290.1, prepared for Environment Canada.

Dodge, M.C. (1977a). Combined use of Modelling Techniques and Smog Chamber Data to Derive Ozone-Precursor Relationships, pp 881-889 in Proceedings of the International Conference on Photochemical Oxidant Pollution and its Control, Ed. B.Dimitriades. EPA Report No. EPA-600/3-77-001b.

ERT (1984). ADOM/TADAP Model Development Program: Volume 6, Gas-Phase Chemistry. Environmental Research & Technology Doc. No. P-B980-530, prepared for Ontario Ministry of the Environment.

Lusis, M.A., Sahota, H. and Yap, D. (1985). The Sarnia Oxidants Study (June 27 - July 18, 1984): Analysis of the Air Quality and Meteorological Data. Ontario Ministry of the Environment Report ARB-124-85-AQM

Yap, D., Ning, D.T., and Dong, W. (1987). An Assessment of Source Contributions to the Ozone Concentrations in Southern Ontario 1979-1985. Ministry of the Environment Report ARB-101-87.

Table 1. Test of Model Predictions

Day	Observed		Predicted	
	Ozone (ppb)	Time	Ozone (ppb)	Time
June 28	62	1400	56	1600
July 3	108	1700	122	1600
July 7	31	1400	45	1600
July 8	68	1530	53	1300
July 8*	68	1530	83	1600
July 14	120	1200	121	1600
July 16	42	1200	39	1600
July 18	40	1300	34	1200

* Second set of initial conditions - see Section 3.

Table 2. Summary of Initial Conditions and Predicted Ozone Maxima

Species	Run / Units	1 Clean day (28 June)	2 Dirty day (3 July)	3 Clean day 2*NO	4 Clean day f*HC	5 Dirty day 2*NO	6 Dirty day f*HC
SO2	ppb	9.3	1.14	9.3	9.3	1.1	1.1
SO4	ug/m^3	12	64	12	12	64	64
NO	ppb	5.0	9.0	10.0	10.0	18.1	18.1
NO2	ppb	3	13	3	3	13	13
O2	ppb	30.3	79.9	30.3	30.3	79.9	79.9
H2O2	ppb	0.007	0.007	0.007	0.007	0.007	0.007
HNO3	ppb	0.612	4.03	0.612	0.612	4.03	4.03
PAN1	ppb	0.002	0.002	0.002	0.002	0.002	0.002
PAN2	ppb	0.002	0.002	0.002	0.002	0.002	0.002
C3H8	ppb	2.46	5.05	2.46	12.30	5.05	25.30
ALKA	ppb	3.4	17.4	3.4	17.0	17.4	86.8
ETHE	ppb	0.009	0.009	0.009	0.043	0.009	0.044
ALKE	ppb	0.006	0.006	0.006	0.103	0.006	0.105
AROM	ppb	0.42	2.04	0.42	0.84	2.04	4.09
HCHO	ppb	2.0	3.4	2.0	10.0	3.4	17.0
ALD2	ppb	0.4	4.9	0.4	2.0	4.9	24.5
KET	ppb	1.3	2.0	1.3	6.5	2.0	10.0
HONO	ppb	0.005	0.005	0.005	0.005	0.005	0.005
RNO3	ppb	0.002	0.002	0.002	0.002	0.002	0.002
ROOH	ppb	0.004	0.004	0.004	0.004	0.004	0.004
CRES	ppb	0.002	0.002	0.002	0.002	0.002	0.002
DIAL	ppb	0.003	0.003	0.003	0.003	0.003	0.003
MGLY	ppb	0.003	0.003	0.003	0.003	0.003	0.003
HO2	ppb	0.007	0.007	0.007	0.007	0.007	0.007
RO2S	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RO2L	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RAO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
KO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RCO3	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
NH3	ppb	0.014	0.014	0.014	0.014	0.014	0.014
NOx	ppb	8.0	22.0	13.0	13.0	31.1	31.1
HC	ppbC	27.33	116.48	27.33	128.35	116.48	539.09
HC/NOx		3.41	5.28	2.10	9.87	3.75	17.33
Max O3	(ppb)	55.65	121.5	38.1	67.7	98.1	145.5
at time:		1600	1600	1600	1400	1600	1300

Table 2 continued

Species	Units	Run 7 Clean day 1.5*HC	8 Dirty day 1.5*HC	9 Clean NOx pert.	10 Clean NOx pert.	11 Clean NOx pert.	12 Clean NOx pert.
SO2	ppb	9.3	1.14	9.3	9.3	9.3	9.3
SO4	ug/m^3	12	64	12	12	12	12
NO	ppb	5.0	9.0	2.5	1.4	1.0	0.7
NO2	ppb	3.0	13.0	1.5	0.8	0.5	0.4
O3	ppb	30.3	79.9	30.3	30.3	30.3	30.3
H2O2	ppb	0.007	0.007	0.007	0.007	0.007	0.007
HNO3	ppb	0.612	4.03	0.612	0.612	0.612	0.612
PAN1	ppb	0.002	0.002	0.002	0.002	0.002	0.002
PAN2	ppb	0.002	0.002	0.002	0.002	0.002	0.002
C3H8	ppb	3.70	7.61	2.46	2.46	2.46	2.46
ALKA	ppb	5.11	26.00	3.39	3.39	3.39	3.39
ETHE	ppb	0.013	0.013	0.009	0.009	0.009	0.009
ALKE	ppb	0.009	0.009	0.006	0.006	0.006	0.006
AROM	ppb	0.634	3.08	0.422	0.422	0.422	0.422
HCHO	ppb	3.00	5.11	2.00	2.00	2.00	2.00
ALD2	ppb	0.60	7.33	0.40	0.40	0.40	0.40
KET	ppb	1.95	3.00	1.30	1.30	1.30	1.30
HONO	ppb	0.005	0.005	0.005	0.005	0.005	0.005
RNO3	ppb	0.002	0.002	0.002	0.002	0.002	0.002
ROOH	ppb	0.004	0.004	0.004	0.004	0.004	0.004
CRES	ppb	0.002	0.002	0.002	0.002	0.002	0.002
DIAL	ppb	0.003	0.003	0.003	0.003	0.003	0.003
MGLY	ppb	0.003	0.003	0.003	0.003	0.003	0.003
HO2	ppb	0.007	0.007	0.007	0.007	0.007	0.007
RO2S	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RO2L	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RAO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
KO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RCO3	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
NH3	ppb	0.014	0.014	0.014	0.014	0.014	0.014
NOx	ppb	8.0	22.0	4.0	2.2	1.5	1.1
HC	ppbC	41.16	174.46	27.33	27.33	27.33	27.33
HC/NOx		5.13	7.92	6.83	12.42	18.22	24.84
Max O3 (ppb)		60.0	128.0	50.2	43.3	39.8	37.5
at time:		1600	1500	1600	1300	1300	1200

Table 2 continued

Species	Run / Units	13 Dirty NOx pert.	14 Dirty NOx pert.	15 Dirty NOx pert.	16 Dirty NOx pert.	17 Clean NOx pert.	18 Clean NOx pert.
SO2	ppb	1.1	1.1	1.1	1.1	9.3	9.3
SO4	ug/m^3	64	64	64	64	12	12
NO	ppb	4.5	2.7	2.0	1.6	6.7	7.5
NO2	ppb	6.5	3.9	3.0	2.4	3.5	4.5
O3	ppb	79.9	79.9	79.9	79.9	30.3	30.3
H2O2	ppb	0.007	0.007	0.007	0.007	0.007	0.007
HNO3	ppb	4.03	4.03	4.03	4.03	0.612	0.612
PAN1	ppb	0.002	0.002	0.002	0.002	0.002	0.002
PAN2	ppb	0.002	0.002	0.002	0.002	0.002	0.002
C3H8	ppb	5.05	5.05	5.05	5.05	2.46	2.46
ALKA	ppb	17.4	17.4	17.4	17.4	3.39	3.39
ETHE	ppb	0.009	0.009	0.009	0.009	0.009	0.009
ALKE	ppb	0.006	0.006	0.006	0.006	0.006	0.006
AROM	ppb	2.04	2.04	2.04	2.04	0.42	0.42
HCHO	ppb	3.4	3.4	3.4	3.4	2.0	2.0
ALD2	ppb	4.9	4.9	4.9	4.9	0.4	0.4
KET	ppb	2.0	2.0	2.0	2.0	1.3	1.3
HONO	ppb	0.005	0.005	0.005	0.005	0.005	0.005
RNO3	ppb	0.002	0.002	0.002	0.002	0.002	0.002
ROOH	ppb	0.004	0.004	0.004	0.004	0.004	0.004
CRES	ppb	0.002	0.002	0.002	0.002	0.002	0.002
DIAL	ppb	0.003	0.003	0.003	0.003	0.003	0.003
MGLY	ppb	0.003	0.003	0.003	0.003	0.003	0.003
HO2	ppb	0.007	0.007	0.007	0.007	0.007	0.007
RO2S	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RO2L	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RAO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
KO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RCO3	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
NH3	ppb	0.014	0.014	0.014	0.014	0.014	0.014
NOx	ppb	11.0	6.6	5.0	4.0	10.2	12.0
HC	ppbC	116.48	116.48	116.48	116.48	27.33	27.33
HC/NOx		10.59	17.65	23.20	29.12	2.68	2.28
Max O3	(ppb)	106.5	97.9	93.4	90.3	49.0	43.2
	time:	1300	1200	1200	1200	1600	1600

Table 2 continued

Species	Run / Units	19 Clean NOx pert.	20 Dirty NOx pert.	21 Dirty NOx pert.	22 Dirty NOx pert.	23 28 June	24 7July
SO2	ppb	9.3	1.1	1.1	1.1	9.6	2.5
SO4	ug/m^3	12	64	64	64	25	6
NO	ppb	7.5	9.8	11.0	13.5	0.2	0.6
NO2	ppb	4.5	14.7	16.5	19.5	0.6	1.3
O3	ppb	30.3	79.9	79.9	79.9	45.0	30.0
H2O2	ppb	0.007	0.007	0.007	0.007	1.4	0.9
HNO3	ppb	0.61	4.03	4.03	4.03	0.60	0.60
PAN1	ppb	0.002	0.002	0.002	0.002	0.002	0.002
PAN2	ppb	0.002	0.002	0.002	0.002	0.002	0.002
C3H8	ppb	3.70	5.05	5.05	7.50	0.98	1.72
ALKA	ppb	5.1	17.4	17.4	26.0	2.6	2.4
ETHE	ppb	0.014	0.009	0.009	0.014	0	0
ALKE	ppb	0.009	0.006	0.006	0.009	0	0
AROM	ppb	0.63	2.04	2.04	3.00	0.10	0
HCHO	ppb	3.0	3.4	3.4	5.1	2.0	1.5
ALD2	ppb	0.6	4.9	4.9	7.3	0.4	1.3
KET	ppb	2.0	2.0	2.0	3.0	1.3	0.5
HONO	ppb	0.005	0.005	0.005	0.005	0.005	0.005
RNO3	ppb	0.002	0.002	0.002	0.002	0.002	0.002
ROOH	ppb	0.004	0.004	0.004	0.004	0.004	0.004
CRES	ppb	0.002	0.002	0.002	0.003	0.002	0.002
DIAL	ppb	0.003	0.003	0.003	0.003	0.003	0.003
MGLY	ppb	0.003	0.003	0.003	0.003	0.003	0.003
HO2	ppb	0.007	0.007	0.007	0.007	0.007	0.007
RO2S	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RO2L	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RAO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
KO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RCO3	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
NH3	ppb	0.014	0.014	0.014	0.014	0.014	0.014
NOx	ppb	12.0	24.5	27.5	33.0	0.8	1.9
HC	ppbC	41.16	116.48	116.48	173.57	16.64	17.16
HC/NOx		3.43	4.75	4.24	5.26	20.80	9.03
Max O3 (ppb)		52.1	121.5	116.0	126.5	46.0	44.8
at time:		1600	1600	1600	1600	1200	1600

Table 2 continued

	Run	25	26	27	28	29	30
Species	Units	8 July	8 July/2	14 July	16 July	17 July	18Jul
SO2	ppb	11.3	11.3	27.8	0.0	5.0	2.4
SO4	ug/m^3	6	6	54	4	5	17
NO	ppb	2.3	8.0	1.0	1.1	5.0	1.0
NO2	ppb	2.2	8.0	10.0	0.3	20.0	0.1
O3	ppb	30	40	80	30	30	30
H2O2	ppb	1.0	1.0	2.0	0.9	1.0	1.0
HNO3	ppb	0.6	0.6	0.6	0.6	0.6	0.6
PAN1	ppb	0.002	0.002	0.002	0.002	0.002	0.002
PAN2	ppb	0.002	0.002	0.002	0.002	0.002	0.002
C3H8	ppb	20.3	3.4	1.5	0.2	4.1	5.0
ALKA	ppb	38.4	14.0	36.9	13.4	13.4	12.9
ETHE	ppb	0	0	1.00	0	0.02	0
ALKE	ppb	0.6	0.2	2.3	0	0.2	0.1
AROM	ppb	2.4	7.8	5.2	0.2	0.8	0.6
HCHO	ppb	3.5	3.5	3.5	0.7	1.6	1.0
ALD2	ppb	0.6	0.6	4.1	0	1.6	0
KET	ppb	0.5	0.5	9.4	0	3.5	0
HONO	ppb	0.005	0.005	0.005	0.005	0.005	0.005
RNO3	ppb	0.002	0.002	0.002	0.002	0.002	0.002
ROOH	ppb	0.004	0.004	0.004	0.004	0.004	0.004
CRES	ppb	0.002	0.002	0.002	0.002	0.002	0.002
DIAL	ppb	0.003	0.003	0.003	0.003	0.003	0.003
MGLY	ppb	0.003	0.003	0.003	0.003	0.003	0.003
HO2	ppb	0.007	0.007	0.007	0.007	0.007	0.007
RO2S	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RO2L	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RAO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
KO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RCO3	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
NH3	ppb	0.014	0.014	0.014	0.014	0.014	0.014
NOx	ppb	4.5	16.0	11.0	1.4	25.0	1.1
HC	ppbC	272.40	135.88	237.75	69.20	85.56	84.15
HC/NOx		60.53	8.49	21.61	49.43	3.42	76.50
Max O3 (ppb)		52.8	83.0	121.4	38.6	47.2	34.5
at time:		1300	1600	1600	1600	1600	1200

Table 2 continued

	Run	31	32	33	34	35	36
Species	Units	A	B	C	D	E	F
SO2	ppb	2.4	2.4	2.4	2.4	2.4	2.4
SO4	ug/m^3	17	17	17	17	17	17
NO	ppb	6	9	12	12	7	12
NO2	ppb	8	12	18	16	10	20
O3	ppb	40	40	40	40	30	30
H2O2	ppb	1	1	1	2	1	1
HNO3	ppb	0.6	0.6	0.6	0.6	0.6	0.6
PAN1	ppb	0.002	0.002	0.002	0.002	0.002	0.002
PAN2	ppb	0.002	0.002	0.002	0.002	0.002	0.002
C3H8	ppb	3.0	2.2	3.0	1.5	5.0	2.5
ALKA	ppb	73.8	55.4	73.8	36.9	12.9	6.5
ETHE	ppb	2.0	1.5	2.0	1.0	0	0
ALKE	ppb	4.6	3.4	4.6	2.3	0.1	0.05
AROM	ppb	10.4	7.8	10.4	5.2	0.6	0.3
HCHO	ppb	7.0	5.2	7.0	3.5	1.0	0.5
ALD2	ppb	8.2	6.1	8.2	4.1	0	0
KET	ppb	18.8	14.1	18.8	9.4	0	0
HONO	ppb	0.005	0.005	0.005	0.005	0.005	0.005
RNO3	ppb	0.002	0.002	0.002	0.002	0.002	0.002
ROOH	ppb	0.004	0.004	0.004	0.004	0.004	0.004
CRES	ppb	0.002	0.002	0.002	0.002	0.002	0.002
DIAL	ppb	0.003	0.003	0.003	0.003	0.003	0.003
MGLY	ppb	0.003	0.003	0.003	0.003	0.003	0.003
HO2	ppb	0.007	0.007	0.007	0.007	0.007	0.007
RO2S	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RO2L	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RAO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
KO2	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
RCO3	ug/m^3	0.01	0.01	0.01	0.01	0.01	0.01
NH3	ppb	0.014	0.014	0.014	0.014	0.014	0.014
NOx	ppb	14	21	30	28	17	32
HC	ppbC	475.5	356.5	475.5	237.8	84.2	42.3
HC/NOx		33.96	16.98	15.85	8.49	4.95	1.32
Max O3 (ppb)		91.2	104.3	125.7	103.4	41.3	29.8
at time:		1300	1400	1500	1600	1600	1100

Table 3. Data to Illustrate Effect of Hydrocarbon Reactivity

	Run	A1 3	A2 18	A3 19	B1 2	B2 20	B3 29
Species	Units	Clean Day 2*NO	Clean NOx pert.	Clean NOx pert.	Dirty day (3 July)	Dirty NOx pert.	17Jul
SO2	ppb	9.300	9.300	9.300	1.140	1.140	5.000
SO4	ug/m^3	12.000	12.000	12.000	64.000	64.000	5.000
NO	ppb	10.000	7.500	7.500	9.040	9.800	5.000
NO2	ppb	3.000	4.500	4.500	13.000	14.700	20.000
O3	ppb	30.300	30.300	30.300	79.900	79.900	30.000
H2O2	ppb	0.007	0.007	0.007	0.007	0.007	1.000
HNO3	ppb	0.612	0.612	0.612	4.030	4.030	0.600
PAN1	ppb	0.002	0.002	0.002	0.002	0.002	0.002
PAN2	ppb	0.002	0.002	0.002	0.002	0.002	0.002
C3H8	ppb	2.460	2.460	3.700	5.050	5.050	4.100
ALKA	ppb	3.390	3.390	5.110	17.400	17.400	13.400
ETHE	ppb	0.009	0.009	0.014	0.009	0.009	0.020
ALKE	ppb	0.006	0.006	0.009	0.006	0.006	0.200
AROM	ppb	0.422	0.422	0.634	2.040	2.040	0.760
HCHO	ppb	2.000	2.000	3.000	3.400	3.400	1.600
ALD2	ppb	0.400	0.400	0.600	4.900	4.900	1.600
KET	ppb	1.300	1.300	1.950	2.000	2.000	3.500
HONO	ppb	0.005	0.005	0.005	0.005	0.005	0.005
RNO3	ppb	0.002	0.002	0.002	0.002	0.002	0.002
ROOH	ppb	0.004	0.004	0.004	0.004	0.004	0.004
CRES	ppb	0.002	0.002	0.002	0.002	0.002	0.002
DIAL	ppb	0.003	0.003	0.003	0.003	0.003	0.003
MGLY	ppb	0.003	0.003	0.003	0.003	0.003	0.003
HO2	ppb	0.007	0.007	0.007	0.007	0.007	0.007
RO2S	ug/m^3	0.010	0.010	0.010	0.010	0.010	0.010
RO2L	ug/m^3	0.010	0.010	0.010	0.010	0.010	0.010
RAO2	ug/m^3	0.010	0.010	0.010	0.010	0.010	0.010
KO2	ug/m^3	0.010	0.010	0.010	0.010	0.010	0.010
RCO3	ug/m^3	0.010	0.010	0.010	0.010	0.010	0.010
NH3	ppb	0.014	0.014	0.014	0.014	0.014	0.014
NOx	ppb	13.000	12.000	12.000	22.040	24.500	25.000
HC	ppbC	27.329	27.329	41.15	116.47	116.475	85.560
HC/NOx		2.102	2.277	3.430	5.285	4.754	3.422
Max O3 (ppb)		38.10	43.20	52.05	121.50	121.50	47.20
at time:		1600	1600	1600	1600	1600	1600

Table 4. Estimate of the effect of controlling NO_x and hydrocarbons

Conditions	O_3 (ppb)	NO_x (ppb)	HC (ppb)	$\delta O_3/\delta X$
Clean	55.56	8.02	27.33	
- 50% NO_x	50.15	4.0		1.4
+ 50% HC	60.00		41.16	0.33
Initial	30.3			
Dirty	121.5	22.04	116.48	
- 50% NO_x	106.5	11.00		1.4
+ 50% HC	128.0		174.46	0.11
Initial	79.9			

Note: X represents NO_x or HC.

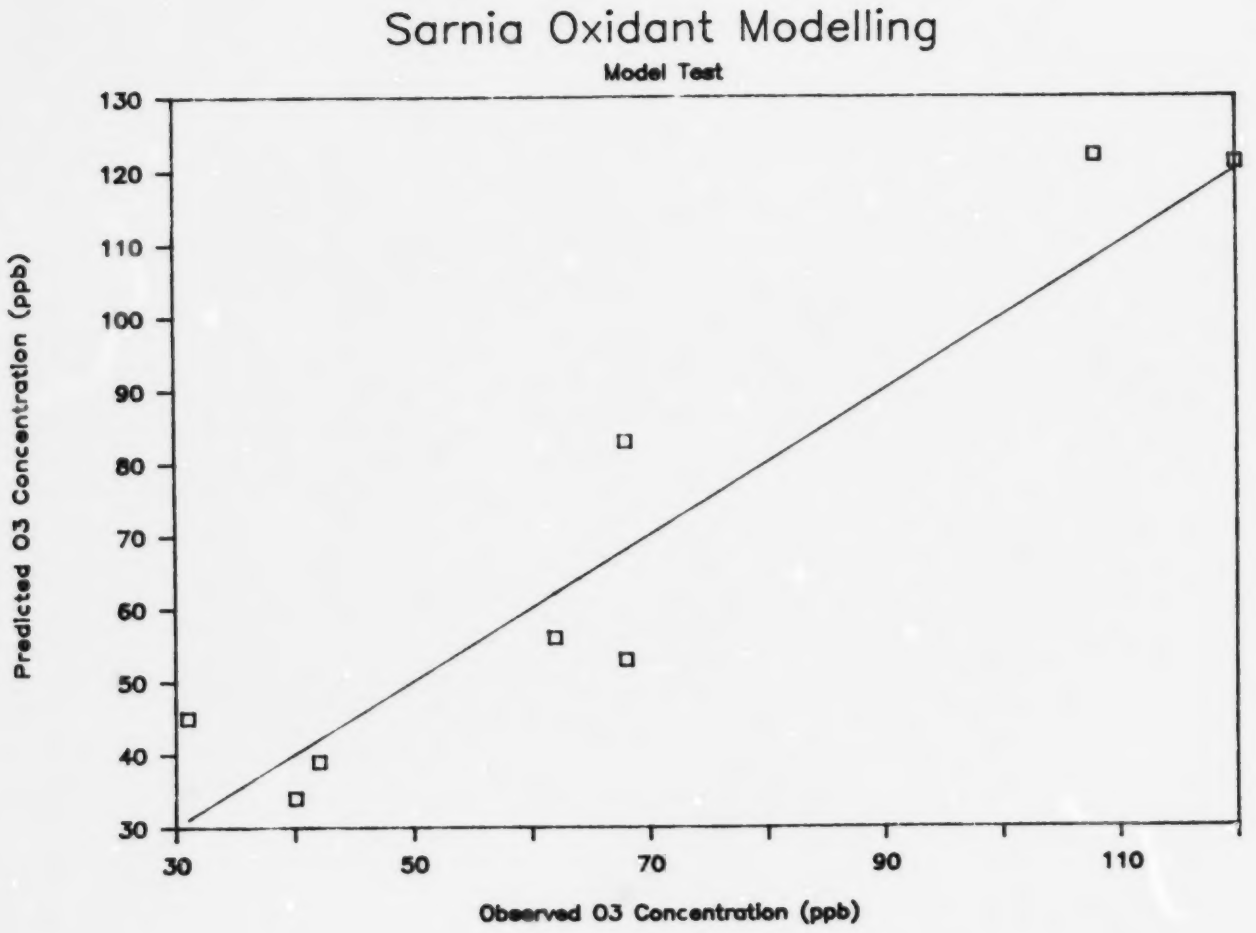


Figure 1. Plot of predicted vs. observed maximum ozone concentration on selected days

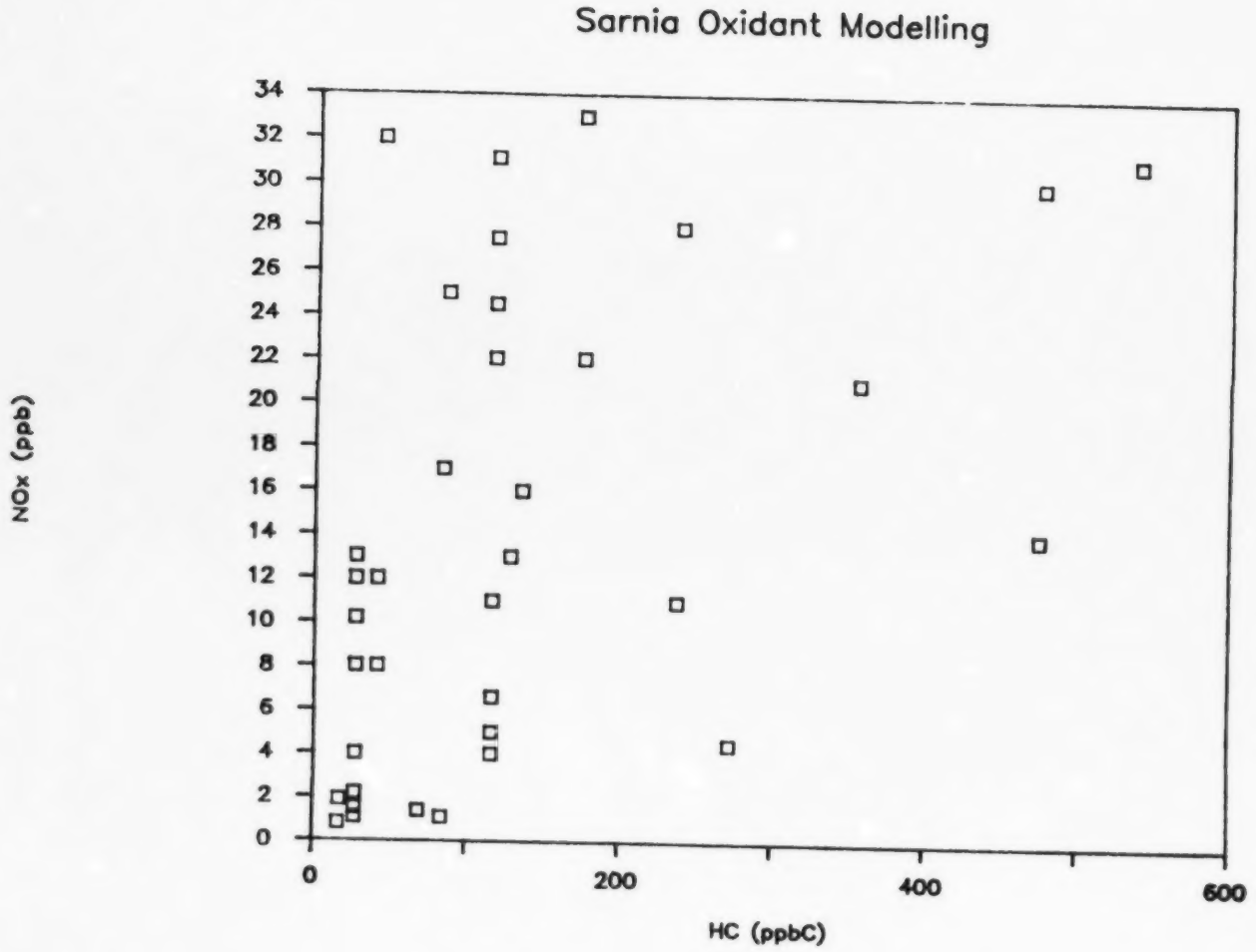


Figure 2. Initial conditions

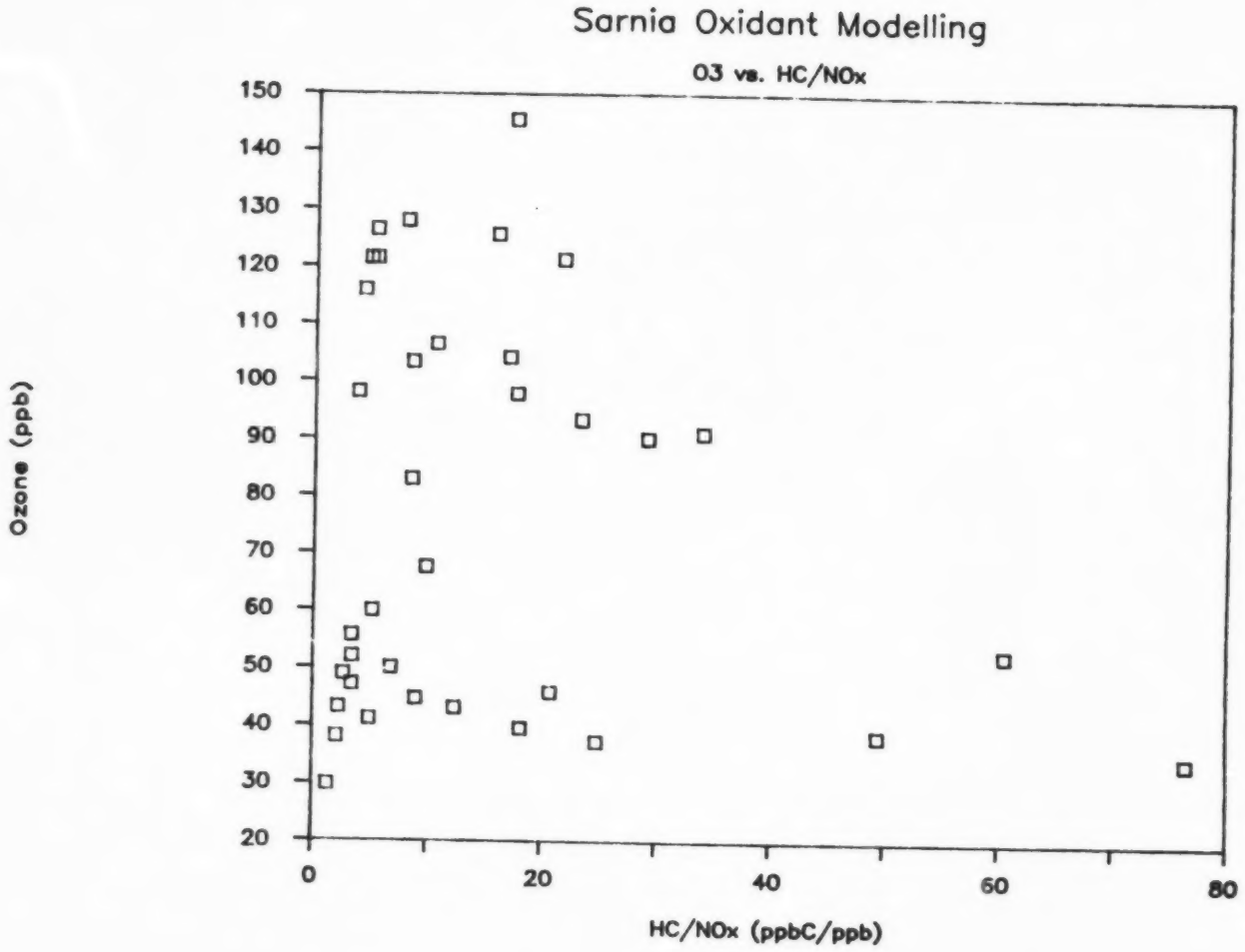


Figure 3. Plot of maximum predicted ozone concentration as a function of hydrocarbon to NO_x ratio (all days)

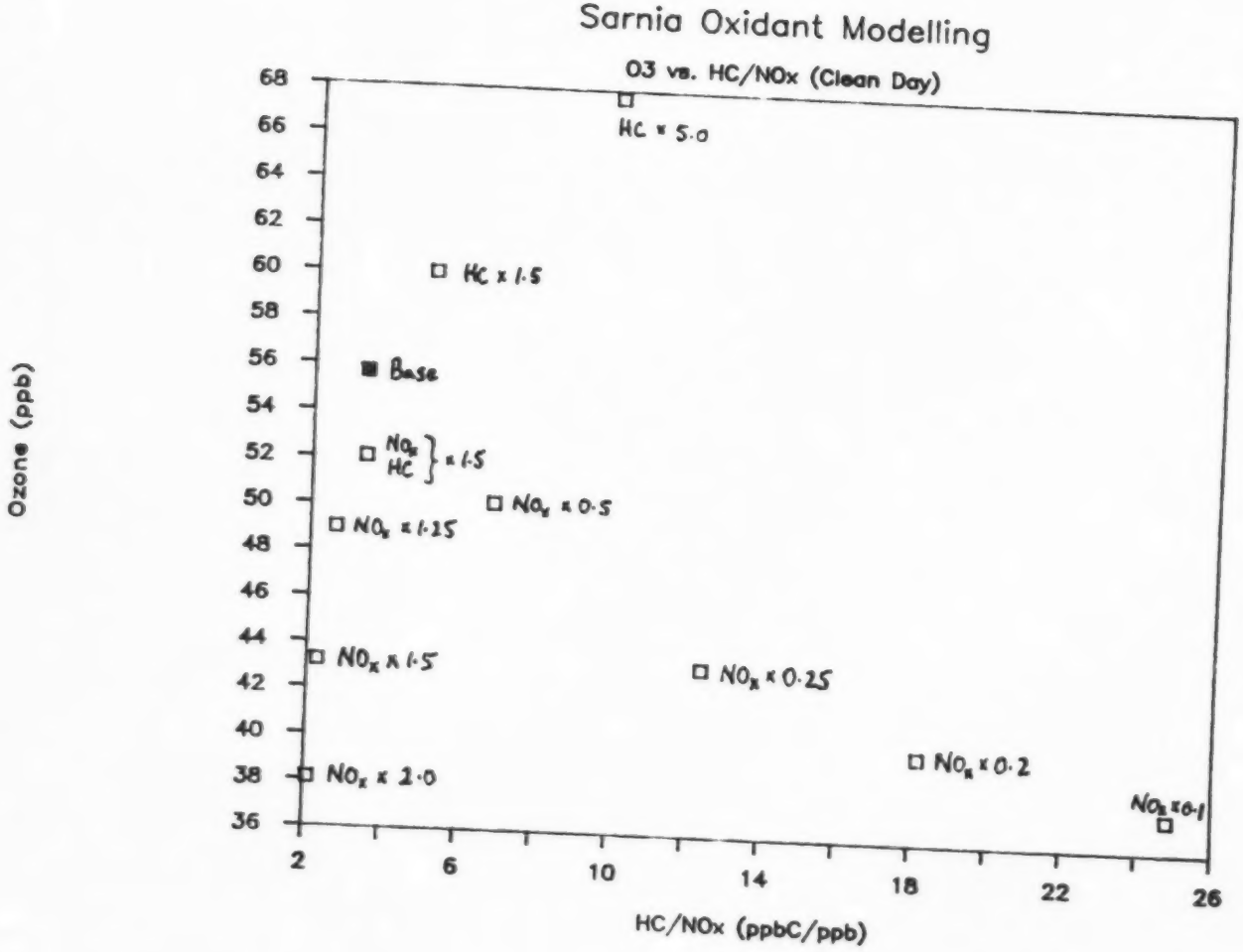


Figure 4. Plot of maximum predicted ozone concentration as a function of hydrocarbon to NO_x ratio (clean day and perturbations)

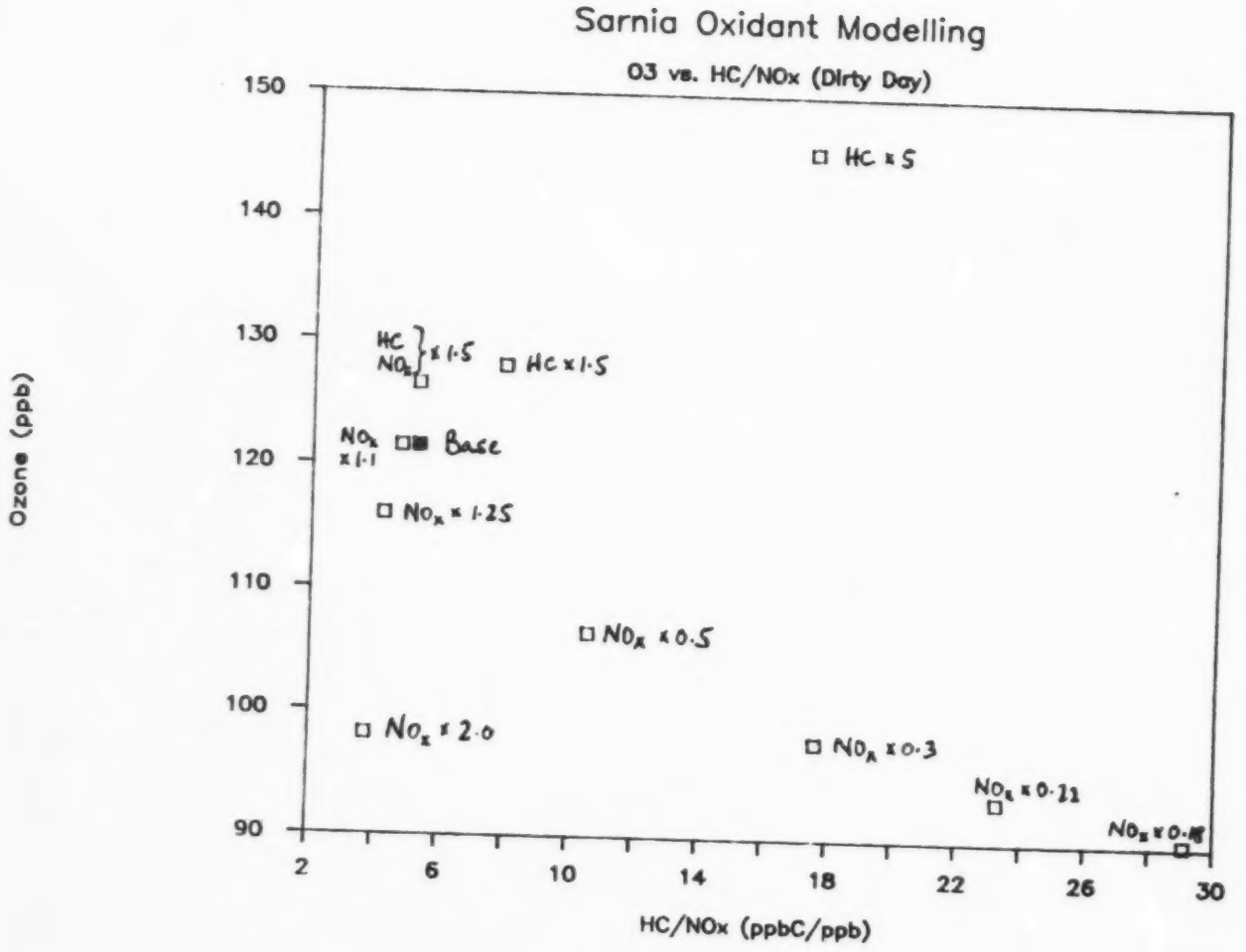


Figure 5. Plot of maximum predicted ozone concentration as a function of hydrocarbon to NO_x ratio (dirty day and perturbations)

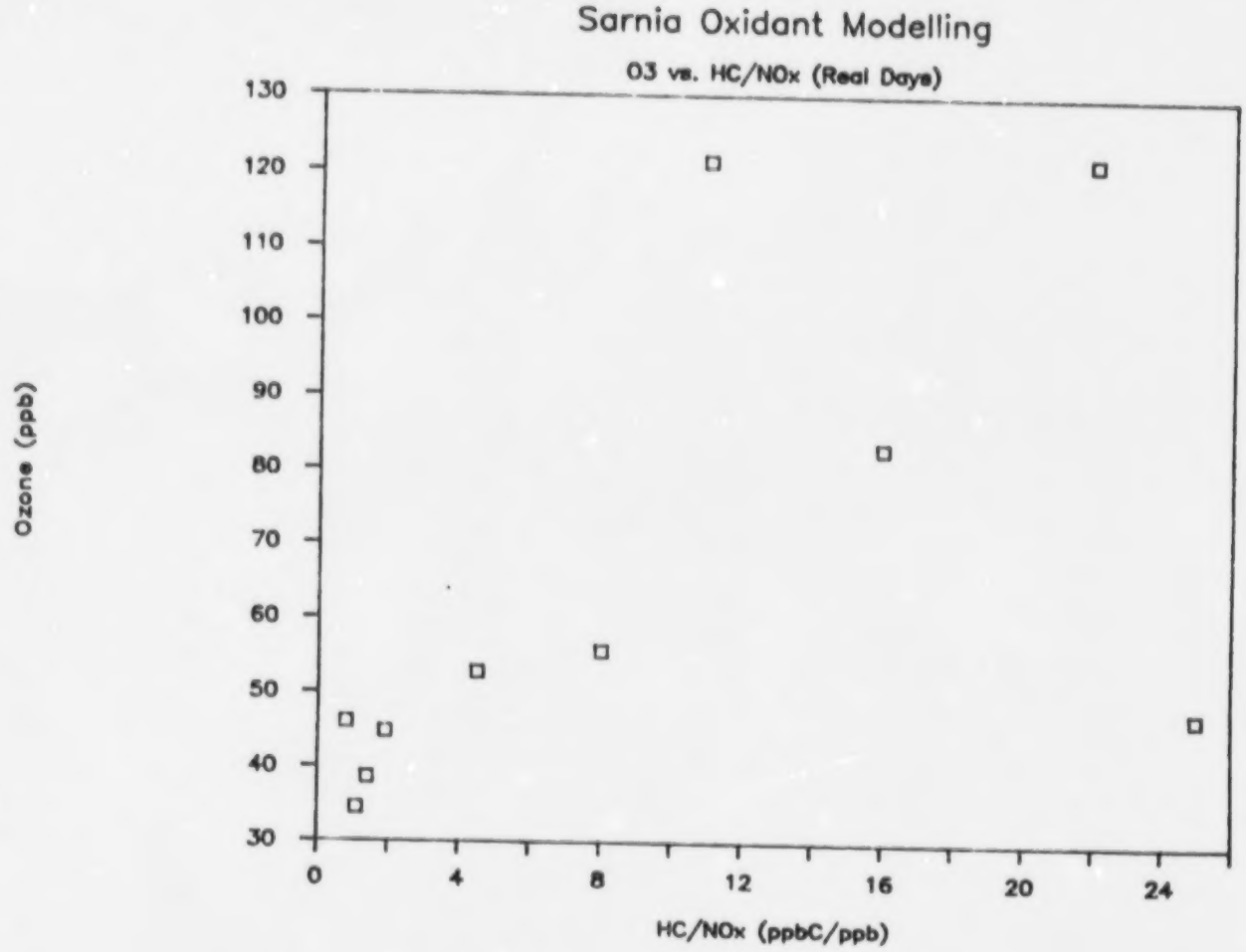


Figure 6. Plot of maximum predicted ozone concentration as a function of hydrocarbon to NO_x ratio (real days)

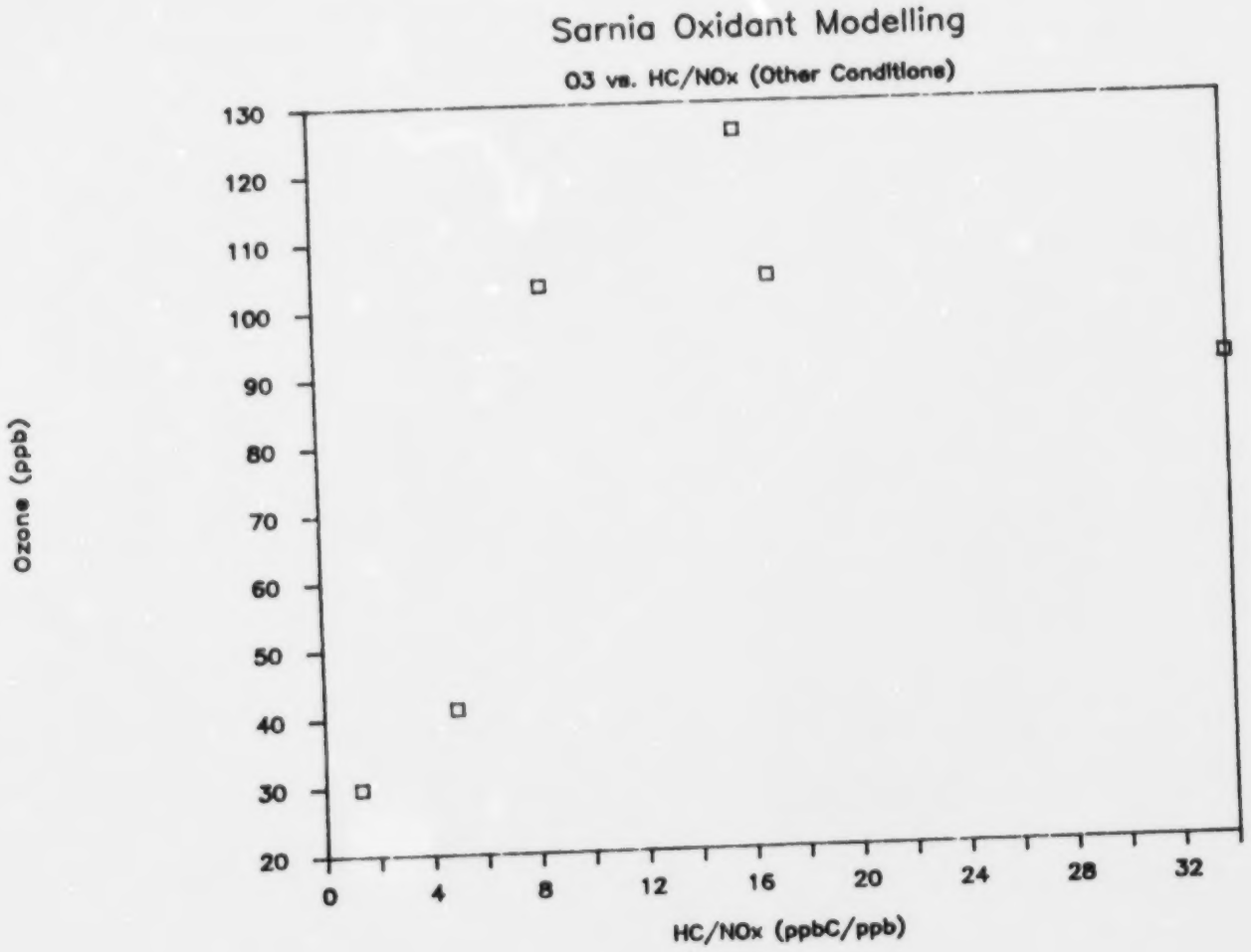


Figure 7. Plot of maximum predicted ozone concentration as a function of hydrocarbon to NO_x ratio (other conditions)

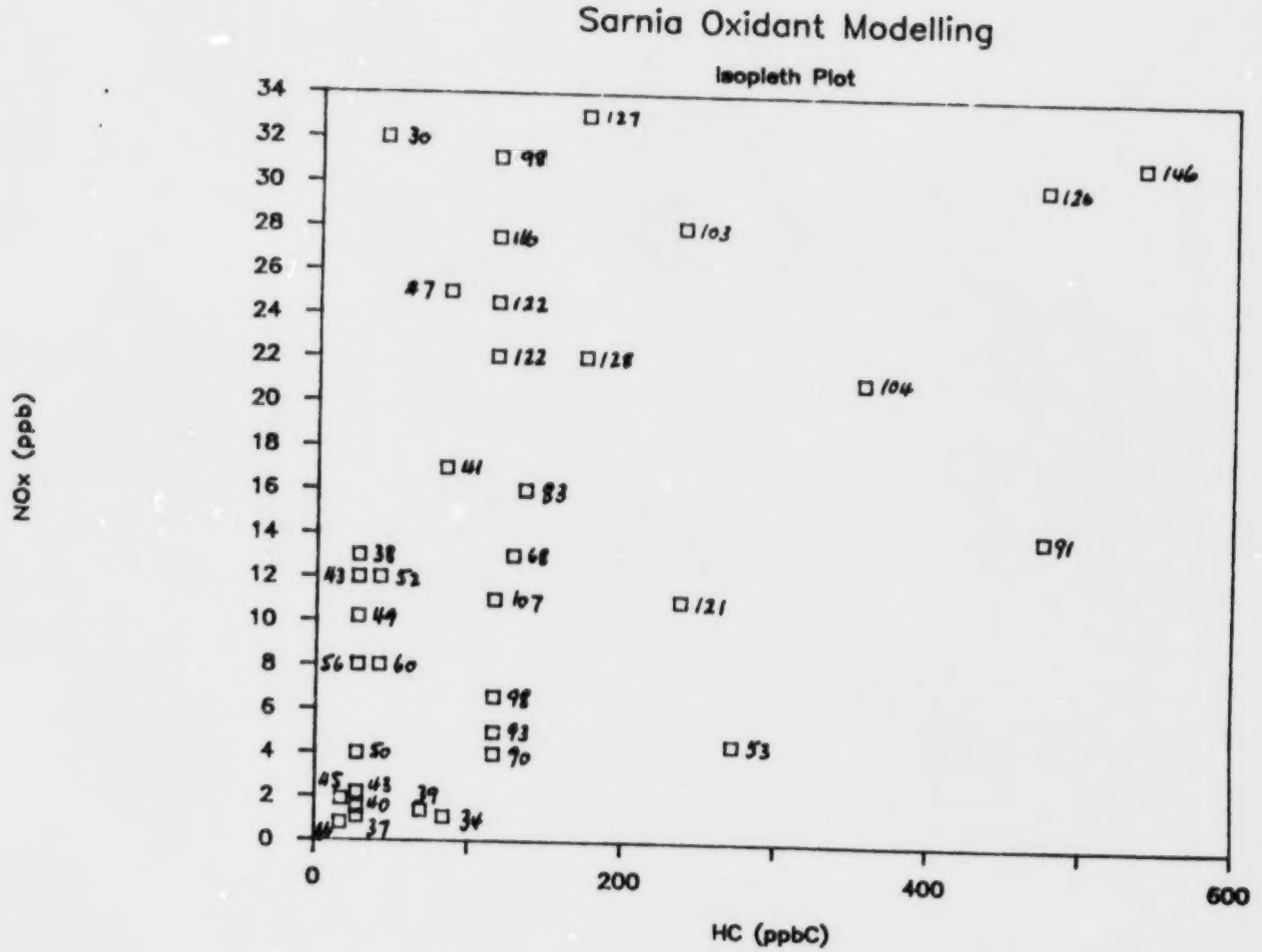
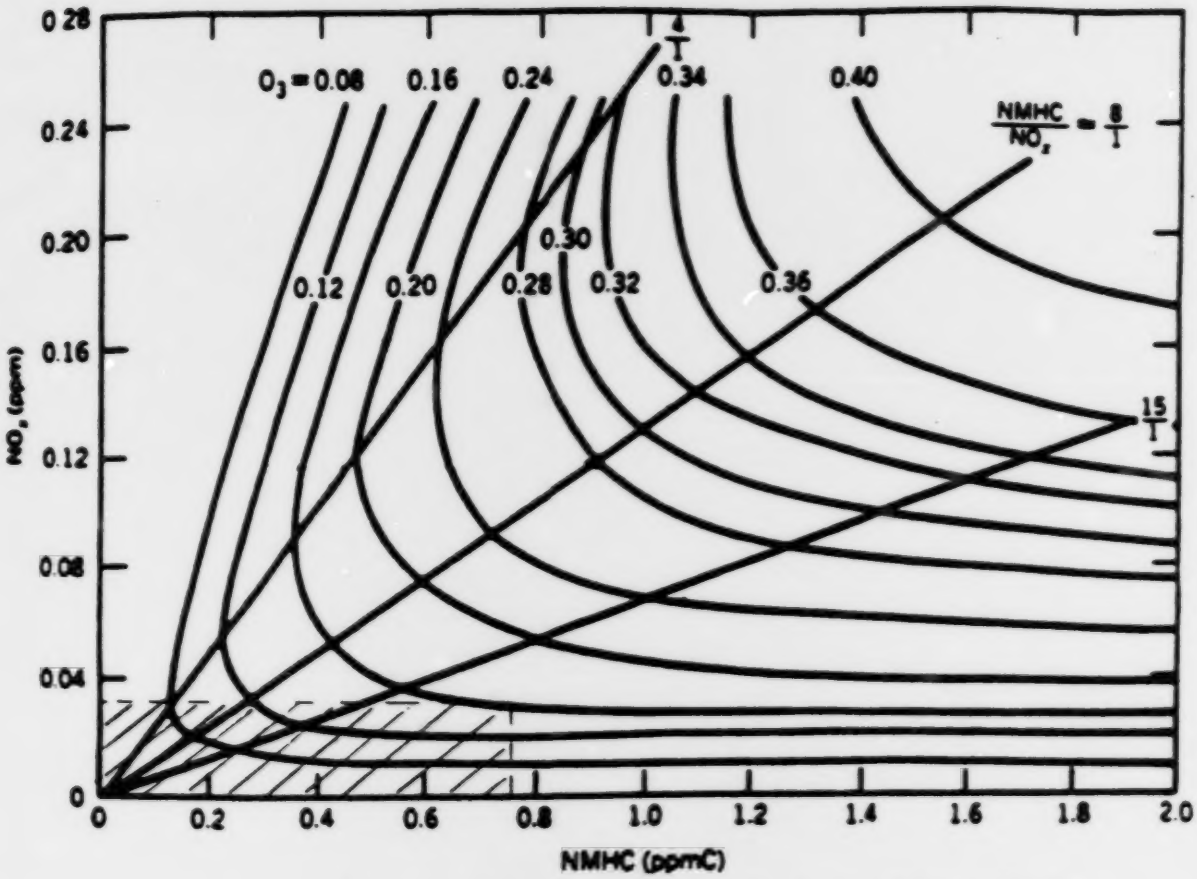


Figure 8. Points for isopleth plot. Indicated values are peak predicted ozone concentrations (ppb).



Ozone isopleths used in EKMA approach (from Dodge, 1977a).

Figure 9. General EKMA diagram. The shaded region contains the conditions modelled in this work.

. BASE LINE RUN (CLEAN DAY, JUNE 28)

Run 1

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	9.300	9.115	8.865	8.540	8.120	7.675	7.355
SO4	(ug/m^3)	12.000	12.750	13.750	15.050	16.650	18.450	19.750
NO	(PPB)	5.020	2.995	2.190	1.380	.678	.259	.112
NO2	(PPB)	3.000	3.685	2.955	2.140	1.315	.659	.349
O3	(PPB)	30.300	31.850	35.550	40.200	46.100	52.000	55.650
H2O2	(PPB)	.007	.007	.008	.012	.040	.190	.464
HNO3	(PPB)	.612	1.720	2.990	4.295	5.460	6.170	6.430
PAN1	(PPB)	.002	.097	.252	.469	.768	1.100	1.300
PAN2	(PPB)	.002	.022	.064	.104	.131	.139	.134
C3H8	(PPB)	2.460	2.400	2.320	2.210	2.075	1.925	1.825
ALKA	(PPB)	3.390	3.130	2.795	2.400	1.960	1.560	1.310
ETHE	(PPB)	.009	.007	.005	.004	.002	.001	.001
ALKE	(PPB)	.006	.003	.001	.000	.000	.000	.000
AROM	(PPB)	.422	.295	.181	.094	.039	.015	.007
HCHO	(PPB)	2.000	1.445	1.160	1.055	1.043	1.002	.917
ALD2	(PPB)	.400	.522	.604	.635	.613	.556	.503
PET	(PPB)	1.300	1.415	1.545	1.705	1.875	2.010	2.080
HONO	(PPB)	.005	.076	.075	.066	.046	.020	.006
RNO3	(PPB)	.002	.056	.119	.188	.253	.299	.318
ROOH	(PPB)	.004	.004	.005	.006	.014	.059	.153
CRES	(PPB)	.002	.013	.012	.008	.003	.001	.001
DIAL	(PPB)	.003	.067	.071	.049	.024	.010	.004
MGLY	(PPB)	.003	.050	.056	.043	.025	.012	.008
HO2	(PPB)	.007	.001	.002	.004	.012	.023	.028
RO2S	(ug/m^3)	.010	.001	.002	.005	.013	.029	.041
RO2L	(ug/m^3)	.010	.000	.001	.001	.001	.002	.003
RAO2	(ug/m^3)	.010	.001	.001	.002	.004	.009	.010
KO2	(ug/m^3)	.010	.000	.000	.000	.001	.002	.002
RCO3	(ug/m^3)	.010	.000	.001	.002	.005	.010	.015
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

. BASE LINE RUN (DIRTY DAY, JULY 3)

Run 2

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	1.140	1.130	1.110	1.085	1.050	1.008	.979
SO4	(ug/m^3)	64.000	64.100	64.100	64.250	64.400	64.550	64.650
NO	(PPB)	9.040	4.390	3.210	1.945	.834	.200	.040
NO2	(PPB)	13.000	14.050	10.800	7.235	3.720	1.155	.301
O3	(PPB)	79.900	80.550	87.100	96.050	107.500	118.000	127.500
H2O2	(PPB)	.007	.007	.008	.013	.049	.330	.805
HNO3	(PPB)	4.030	6.600	9.610	12.650	15.200	16.400	16.600
PAN1	(PPB)	.002	.745	1.735	2.985	4.555	6.165	6.885
PAN2	(PPB)	.002	.075	.265	.518	.765	.915	.933
C3H8	(PPB)	5.050	4.975	4.860	4.700	4.485	4.250	4.100
ALKA	(PPB)	17.400	16.500	15.350	13.850	11.950	10.060	8.985
ETHE	(PPB)	.009	.008	.006	.005	.003	.002	.002
ALKE	(PPB)	.006	.003	.001	.000	.000	.000	.000
AROM	(PPB)	2.040	1.650	1.205	.774	.418	.203	.123
HCHO	(PPB)	3.400	2.775	2.500	2.460	2.485	2.340	2.010
ALD2	(PPB)	4.900	4.575	4.200	3.790	3.370	2.925	2.545
KET	(PPB)	2.000	2.350	2.820	3.435	4.170	4.845	5.135
HONO	(PPB)	.005	.071	.074	.065	.042	.013	.002
RNO3	(PPB)	.002	.167	.392	.667	.967	1.215	1.310
ROOH	(PPB)	.004	.004	.005	.008	.030	.225	.845
CRES	(PPB)	.002	.043	.055	.045	.028	.015	.009
DIAL	(PPB)	.003	.234	.328	.304	.211	.116	.066
MGLY	(PPB)	.003	.160	.228	.226	.175	.110	.070
HO2	(PPB)	.007	.001	.002	.005	.014	.034	.034
RO2S	(ug/m^3)	.010	.002	.003	.008	.023	.079	.159
RO2L	(ug/m^3)	.010	.001	.001	.003	.006	.016	.036
RAO2	(ug/m^3)	.010	.001	.002	.006	.017	.055	.104
KO2	(ug/m^3)	.010	.000	.000	.000	.001	.004	.009
RCO3	(ug/m^3)	.010	.001	.002	.004	.011	.042	.120
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 3

. PERTURBED NO EQUALS TO TWO TIMES BASE LINE CONC (CLEAN DAY, JUNE 2

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	PPB)	9.300	9.185	9.040	8.875	8.695	8.515	8.350
SO4	ug/m^3)	12.000	12.450	13.050	13.700	14.400	15.150	15.750
NO	PPB)	10.000	5.675	4.925	4.105	3.310	2.605	2.050
NO2	PPB)	3.000	6.095	5.440	4.785	4.165	3.605	3.165
O3	PPB)	30.300	28.200	29.950	31.900	33.950	36.050	38.100
H2O2	PPB)	.007	.007	.006	.006	.006	.006	.007
HNO3	PPB)	.612	1.705	2.970	4.290	5.560	6.690	7.590
PAN1	PPB)	.002	.056	.131	.221	.318	.414	.493
PAN2	PPB)	.002	.012	.033	.057	.076	.088	.093
C3H8	PPB)	2.460	2.425	2.375	2.320	2.260	2.200	2.145
ALKA	PPB)	3.390	3.225	3.025	2.805	2.580	2.370	2.195
ETHE	PPB)	.009	.008	.006	.005	.004	.003	.003
ALKE	PPB)	.006	.003	.002	.001	.000	.000	.000
AROM	PPB)	.422	.339	.256	.185	.129	.089	.064
HCHO	PPB)	2.000	1.450	1.115	.947	.875	.853	.846
ALD2	PPB)	.400	.486	.556	.604	.630	.640	.638
KET	PPB)	1.300	1.365	1.445	1.525	1.610	1.690	1.755

Run 4

. PERTURBED HC EQUAL TO 1 PLUS DELTA C TIME BASE LINE CONCS (CLEAN I

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	PPB)	9.300	9.015	8.690	8.440	8.325	8.235	8.170
SO4	ug/m^3)	12.000	13.100	14.400	15.400	15.900	16.250	16.550
NO	PPB)	5.020	1.720	.519	.053	.004	.003	.003
NO2	PPB)	3.000	3.270	1.495	.233	.030	.030	.032
O3	PPB)	30.300	44.100	59.150	67.450	67.650	67.050	66.700
H2O2	PPB)	.007	.020	.099	.564	.898	.948	.962
HNO3	PPB)	.612	2.300	3.505	3.840	3.840	3.830	3.820
PAN1	PPB)	.002	.812	2.115	3.235	3.455	3.485	3.500
PAN2	PPB)	.002	.086	.222	.299	.303	.290	.277
C3H8	PPB)	12.300	11.800	11.300	10.900	10.700	10.550	10.450
ALKA	PPB)	17.000	14.950	12.850	11.450	10.850	10.400	9.995
ETHE	PPB)	.043	.031	.022	.016	.014	.012	.011
ALKE	PPB)	.103	.033	.008	.002	.001	.001	.000
AROM	PPB)	.843	.486	.255	.152	.120	.099	.085
HCHO	PPB)	10.000	6.225	4.160	2.925	1.955	1.335	.994
ALD2	PPB)	2.000	2.800	3.090	2.990	2.600	2.235	2.020
KET	PPB)	6.530	7.380	8.210	8.695	8.695	8.615	8.550

Run 5

. PERTURBED NO EQUALS TO 2 TIMES BASE LINE CONC (DIRTY DAY, JULY 3

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	PPB)	1.140	1.135	1.120	1.105	1.085	1.065	1.040
SO4	ug/m^3)	64.000	64.000	64.100	64.150	64.200	64.300	64.400
NO	PPB)	18.100	7.155	6.025	4.740	3.480	2.395	1.585
NO2	PPB)	13.000	20.550	17.600	14.550	11.500	8.770	6.585
O3	PPB)	79.900	72.650	76.550	80.750	85.600	91.800	98.100
H2O2	PPB)	.007	.007	.007	.007	.008	.010	.015
HNO3	PPB)	4.030	6.670	9.805	13.100	16.300	19.050	21.150
PAN1	PPB)	.002	.520	1.160	1.875	2.620	3.370	4.050
PAN2	PPB)	.002	.047	.163	.317	.469	.595	.676
C3H8	PPB)	5.050	4.995	4.915	4.825	4.710	4.585	4.465
ALKA	PPB)	17.400	16.750	15.950	14.950	13.950	12.800	11.800
ETHE	PPB)	.009	.008	.007	.006	.005	.004	.003
ALKE	PPB)	.006	.003	.002	.001	.000	.000	.000
AROM	PPB)	2.040	1.750	1.420	1.090	.798	.561	.394
HCHO	PPB)	3.400	2.735	2.380	2.255	2.255	2.310	2.355
ALD2	PPB)	4.900	4.645	4.355	4.060	3.780	3.530	3.315
KET	PPB)	2.000	2.250	2.570	2.955	3.370	3.800	4.190

Run 6

. PERTURBED HC EQUAL 1 PLUS DELTA C TIMES BASE LINE CONC (DIRTY DAY.

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	PPB)	1.140	1.130	1.110	1.100	1.090	1.080	1.080
SO4	ug/m^3)	64.000	64.100	64.100	64.200	64.200	64.200	64.300
NO	PPB)	9.040	2.845	.913	.019	.001	.000	.000
NO2	PPB)	13.000	11.850	5.220	.190	.038	.034	.027
O3	PPB)	79.900	99.800	128.500	145.500	143.500	141.500	140.500
H2O2	PPB)	.007	.018	.095	.879	.961	.920	.888
HNO3	PPB)	4.030	6.520	8.575	9.170	9.145	9.115	9.090
PAN1	PPB)	.002	3.840	8.930	13.150	13.250	13.250	13.350
PAN2	PPB)	.002	.160	.579	.991	1.050	1.060	1.045
C3H8	PPB)	25.300	24.850	24.300	23.850	23.650	23.450	23.300
ALKA	PPB)	86.800	82.450	76.850	72.250	70.300	68.600	67.300
ETHE	PPB)	.044	.038	.032	.027	.025	.023	.022
ALKE	PPB)	.105	.046	.016	.005	.002	.001	.000
AROM	PPB)	4.090	3.285	2.435	1.865	1.665	1.500	1.380
HCHO	PPB)	17.000	13.200	10.650	8.135	5.505	3.845	2.825
ALD2	PPB)	24.500	22.850	21.000	19.150	16.850	14.900	13.550
KET	PPB)	10.000	11.750	14.050	15.600	15.500	15.400	15.200

: PERTURBED HC EQUAL TO 1 + 0.5 TIMES BASE LINE CONC RUN (CLEAN DAY, JUNE 28)

Run 7

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	9.300	9.095	8.815	8.460	8.005	7.650	7.445
SO4	(ug/m^3)	12.000	12.800	13.950	15.350	17.150	18.550	19.400
NO	(PPB)	5.020	2.790	1.835	.966	.326	.096	.045
NO2	(PPB)	3.000	3.645	2.785	1.790	.839	.319	.169
O3	(PPB)	30.300	33.350	39.000	45.700	53.500	58.250	60.000
H2O2	(PPB)	.007	.008	.010	.023	.135	.487	.855
HNO3	(PPB)	.612	1.840	3.210	4.530	5.460	5.785	5.845
PAN1	(PPB)	.003	.166	.439	.834	1.375	1.770	1.915
PAN2	(PPB)	.003	.038	.110	.176	.219	.224	.213
C3H8	(PPB)	3.700	3.595	3.450	3.275	3.050	2.880	2.780
ALKA	(PPB)	5.110	4.660	4.110	3.475	2.780	2.310	2.070
ETHE	(PPB)	.013	.010	.007	.005	.003	.002	.001
ALKE	(PPB)	.009	.004	.001	.000	.000	.000	.000
AROM	(PPB)	.634	.427	.248	.119	.046	.020	.013
HCHO	(PPB)	3.000	2.080	1.605	1.400	1.290	1.120	.965
ALD2	(PPB)	.602	.796	.915	.945	.888	.796	.725
KET	(PPB)	1.950	2.140	2.360	2.620	2.875	3.020	3.060
HONO	(PPB)	.005	.079	.071	.055	.024	.006	.002
RNO3	(PPB)	.002	.091	.196	.304	.401	.448	.462
ROOH	(PPB)	.004	.004	.005	.010	.050	.201	.420
CRES	(PPB)	.002	.020	.018	.010	.004	.002	.001
DIAL	(PPB)	.003	.105	.104	.065	.029	.013	.007
MGLY	(PPB)	.003	.079	.084	.060	.032	.018	.014
HO2	(PPB)	.007	.002	.003	.008	.023	.032	.030
RO2S	(ug/m^3)	.010	.002	.004	.010	.031	.058	.071
RO2L	(ug/m^3)	.010	.001	.001	.002	.004	.006	.008
RAO2	(ug/m^3)	.010	.001	.002	.004	.013	.020	.022
KO2	(ug/m^3)	.010	.000	.000	.000	.002	.004	.005
RCO3	(ug/m^3)	.010	.001	.002	.004	.012	.024	.035
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

PERTURBED CH EQUAL TO 1 PLUS 0.5 TIMES BASE LINE CONC RUN (DIRTY DAY, JULY 3)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	1.140	1.130	1.110	1.085	1.045	1.020	1.005
SO4	(ug/m^3)	64.000	64.100	64.100	64.250	64.400	64.500	64.550
NO	(PPB)	9.040	4.120	2.700	1.285	.278	.014	.005
NO2	(PPB)	13.000	13.750	9.940	5.620	1.640	.138	.074
O3	(PPB)	79.900	83.450	94.050	108.500	123.500	128.000	128.000
H2O2	(PPB)	.007	.008	.011	.031	.245	.819	.931
HNO3	(PPB)	4.030	6.640	9.630	12.450	14.100	14.300	14.300
PAN1	(PPB)	.003	1.145	2.720	4.825	7.350	8.610	8.735
PAN2	(PPB)	.003	.116	.420	.842	1.235	1.365	1.335
C3H8	(PPB)	7.610	7.485	7.305	7.050	6.730	6.520	6.400
ALKA	(PPB)	26.000	24.750	22.950	20.550	17.750	16.000	15.150
ETHE	(PPB)	.013	.011	.009	.007	.005	.004	.003
ALKE	(PPB)	.009	.004	.001	.000	.000	.000	.000
AROM	(PPB)	3.080	2.475	1.790	1.120	.600	.388	.306
HCHO	(PPB)	5.110	4.105	3.625	3.460	3.250	2.590	1.905
ALD2	(PPB)	7.330	6.840	6.260	5.620	4.950	4.225	3.555
KET	(PPB)	3.000	3.535	4.270	5.235	6.300	6.760	6.790
HONO	(PPB)	.005	.069	.066	.048	.016	.001	.000
RNO3	(PPB)	.002	.255	.604	1.040	1.470	1.645	1.660
ROOH	(PPB)	.004	.005	.007	.020	.172	1.177	2.720
CRES	(PPB)	.002	.065	.081	.065	.040	.028	.023
DIAL	(PPB)	.003	.356	.498	.455	.305	.178	.107
MGLY	(PPB)	.003	.245	.348	.341	.253	.156	.103
HO2O	(PPB)	.007	.002	.004	.010	.034	.030	.014
RO2S	(ug/m^3)	.010	.003	.006	.017	.073	.270	.374
RO2L	(ug/m^3)	.010	.001	.002	.006	.020	.094	.192
RAO2	(ug/m^3)	.010	.002	.005	.013	.058	.259	.553
KO2O	(ug/m^3)	.010	.000	.000	.001	.003	.017	.037
RCO3	(ug/m^3)	.010	.001	.003	.009	.038	.303	.745
NH3O	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 8

Run 9

NO, NO2 CONC SET AT 2.5, 1.5 PPB RESPECTIVELY (CLEAN DAY, JUNE 28

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	9.300	8.955	8.475	8.030	7.755	7.565	7.415
SO4	(ug/m^3)	12.000	13.350	15.300	17.050	18.150	18.950	19.500
NO	(PPB)	2.470	1.028	.377	.097	.034	.022	.023
NO2	(PPB)	1.480	1.560	.791	.273	.109	.073	.078
O3	(PPB)	30.300	35.450	42.800	48.050	49.600	49.950	50.150
H2O2	(PPB)	.007	.016	.088	.463	.961	1.365	1.640
HNO3	(PPB)	.612	1.580	2.465	2.830	2.905	2.920	2.925
PAN1	(PPB)	.002	.206	.586	.946	1.090	1.135	1.125
PAN2	(PPB)	.002	.052	.127	.158	.155	.145	.133
C3H8	(PPB)	2.460	2.345	2.190	2.040	1.950	1.890	1.845
ALKA	(PPB)	3.390	2.910	2.325	1.865	1.620	1.465	1.355
ETHE	(PPB)	.009	.006	.003	.002	.001	.001	.001
ALKE	(PPB)	.006	.002	.000	.000	.000	.000	.000
AROM	(PPB)	.422	.216	.082	.031	.017	.011	.008
HCHO	(PPB)	2.000	1.430	1.185	.982	.778	.626	.544
ALD2	(PPB)	.400	.581	.628	.572	.498	.438	.402
KET	(PPB)	1.300	1.510	1.745	1.905	1.955	1.965	1.970
HONO	(PPB)	.005	.052	.030	.006	.001	.001	.001
RNO3	(PPB)	.002	.097	.198	.258	.278	.284	.286
ROOH	(PPB)	.004	.007	.030	.162	.420	.727	.993
CRES	(PPB)	.002	.014	.007	.003	.001	.001	.001
DIAL	(PPB)	.003	.081	.049	.020	.010	.005	.004
MGLY	(PPB)	.003	.067	.048	.023	.015	.013	.011
HO2	(PPB)	.007	.007	.019	.034	.035	.032	.028
RO2S	(ug/m^3)	.010	.007	.022	.051	.077	.085	.078
RO2L	(ug/m^3)	.010	.002	.004	.006	.009	.010	.009
RAO2	(ug/m^3)	.010	.003	.009	.018	.024	.025	.021
KO2	(ug/m^3)	.010	.000	.001	.003	.004	.005	.004
RCO3	(ug/m^3)	.010	.003	.008	.019	.034	.041	.040
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 10

NO, NO2 CONC. SET AT 1.4, 0.8 PPB RESPECTIVELY (CLEAN DAY, JUNE 28

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	9.300	8.850	8.465	8.230	8.055	7.910	7.785
SO4	(ug/m^3)	12.000	13.800	15.300	16.300	16.950	17.550	18.000
NO	(PPB)	1.380	.333	.084	.023	.011	.013	.016
NO2	(PPB)	.791	.673	.220	.069	.035	.043	.053
O3	(PPB)	30.300	37.250	42.100	43.250	43.250	43.050	43.050
H2O2	(PPB)	.007	.094	.446	.914	1.280	1.555	1.755
HNO3	(PPB)	.612	1.265	1.525	1.570	1.580	1.580	1.585
PAN1	(PPB)	.002	.307	.631	.766	.803	.798	.787
PAN2	(PPB)	.002	.077	.139	.149	.144	.132	.121
C3H8	(PPB)	2.460	2.315	2.185	2.105	2.050	2.000	1.965
ALKA	(PPB)	3.390	2.775	2.315	2.070	1.900	1.760	1.650
ETHE	(PPB)	.009	.005	.003	.002	.002	.002	.001
ALKE	(PPB)	.006	.001	.000	.000	.000	.000	.000
AROM	(PPB)	.422	.176	.080	.049	.034	.024	.019
HCHO	(PPB)	2.000	1.385	1.060	.782	.574	.446	.398
ALD2	(PPB)	.400	.597	.598	.530	.453	.394	.370
KET	(PPB)	1.300	1.565	1.730	1.785	1.795	1.790	1.795
HONO	(PPB)	.005	.022	.004	.001	.000	.000	.000
RNO3	(PPB)	.002	.120	.192	.217	.227	.230	.235
ROOH	(PPB)	.004	.031	.163	.447	.826	1.200	1.475
CRES	(PPB)	.002	.012	.007	.004	.003	.002	.002
DIAL	(PPB)	.003	.079	.044	.024	.014	.009	.006
MGLY	(PPB)	.003	.069	.043	.026	.019	.016	.013
HO2	(PPB)	.007	.020	.032	.033	.030	.028	.025
RO2S	(ug/m^3)	.010	.022	.049	.084	.100	.100	.082
RO2L	(ug/m^3)	.010	.006	.009	.014	.016	.015	.011
RAO2	(ug/m^3)	.010	.010	.020	.033	.039	.037	.027
KO2	(ug/m^3)	.010	.001	.002	.004	.005	.006	.004
RCO3	(ug/m^3)	.010	.008	.019	.042	.056	.058	.044
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 11

NO, NOX CONC SET AT 1.0, 0.5 PPB RESPECTIVELY (CLEAN DAY, JUNE 28)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	9.300	8.875	8.595	8.410	8.270	8.135	8.025
SO4	(ug/m^3)	12.000	13.700	14.800	15.500	16.150	16.650	17.100
NO	(PPB)	.988	.183	.044	.011	.008	.010	.013
NO2	(PPB)	.498	.405	.117	.035	.024	.032	.039
O3	(PPB)	30.300	36.550	39.450	39.750	39.450	39.150	39.150
H2O2	(PPB)	.007	.191	.604	1.003	1.290	1.505	1.680
HNO3	(PPB)	.612	1.025	1.135	1.150	1.150	1.150	1.155
PAN1	(PPB)	.002	.298	.523	.600	.613	.606	.597
PAN2	(PPB)	.002	.075	.123	.132	.125	.116	.107
C3H8	(PPB)	2.460	2.320	2.225	2.165	2.120	2.075	2.035
ALKA	(PPB)	3.390	2.805	2.455	2.260	2.105	1.970	1.865
ETHE	(PPB)	.009	.005	.004	.003	.003	.002	.002
ALKE	(PPB)	.006	.001	.000	.000	.000	.000	.000
AROM	(PPB)	.422	.185	.104	.072	.053	.040	.031
HCHO	(PPB)	2.000	1.355	.989	.694	.488	.376	.336
ALD2	(PPB)	.400	.583	.576	.503	.424	.372	.352
KET	(PPB)	1.300	1.545	1.660	1.685	1.685	1.680	1.685
HONO	(PPB)	.005	.010	.002	.000	.000	.000	.000
RNO3	(PPB)	.002	.112	.164	.181	.187	.192	.197
ROOH	(PPB)	.004	.064	.249	.594	1.014	1.390	1.660
CRES	(PPB)	.002	.013	.008	.006	.005	.003	.003
DIAL	(PPB)	.003	.078	.049	.028	.017	.011	.009
MGLY	(PPB)	.003	.067	.044	.028	.021	.017	.014
HO2	(PPB)	.007	.026	.032	.030	.027	.026	.024
RO2S	(ug/m^3)	.010	.031	.059	.099	.109	.102	.083
RO2L	(ug/m^3)	.010	.009	.013	.020	.020	.017	.013
RAO2	(ug/m^3)	.010	.014	.025	.044	.050	.044	.032
KO2	(ug/m^3)	.010	.001	.002	.005	.006	.006	.004
RCO3	(ug/m^3)	.010	.011	.026	.058	.069	.062	.046
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 12

NO, NO2 CONC SET AT 0.7, 0.4 PPB RESPECTIVELY (CLEAN DAY, JUNE 28)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	9.300	8.925	8.695	8.545	8.410	8.290	8.185
SO4	(ug/m^3)	12.000	13.500	14.400	15.000	15.550	16.050	16.400
NO	(PPB)	.699	.124	.028	.006	.006	.008	.010
NO2	(PPB)	.398	.283	.074	.020	.020	.025	.031
O3	(PPB)	30.300	35.600	37.450	37.400	37.000	36.700	36.600
H2O2	(PPB)	.007	.261	.678	1.023	1.255	1.445	1.595
HNO3	(PPB)	.612	.883	.942	.947	.947	.947	.949
PAN1	(PPB)	.002	.261	.430	.480	.483	.478	.470
PAN2	(PPB)	.002	.065	.106	.113	.107	.100	.092
C3H8	(PPB)	2.460	2.340	2.260	2.215	2.165	2.125	2.095
ALKA	(PPB)	3.390	2.870	2.585	2.405	2.255	2.125	2.020
ETHE	(PPB)	.009	.006	.004	.004	.003	.003	.002
ALKE	(PPB)	.006	.001	.001	.000	.000	.000	.000
AROM	(PPB)	.422	.204	.130	.095	.072	.055	.044
HCHO	(PPB)	2.000	1.335	.951	.644	.440	.336	.295
ALD2	(PPB)	.400	.564	.553	.477	.400	.352	.334
KET	(PPB)	1.300	1.510	1.595	1.605	1.605	1.600	1.605
HONO	(PPB)	.005	.006	.001	.000	.000	.000	.000
RNO3	(PPB)	.002	.098	.139	.152	.157	.162	.168
ROOH	(PPB)	.004	.090	.307	.688	1.125	1.505	1.770
CRES	(PPB)	.002	.013	.010	.008	.006	.005	.004
DIAL	(PPB)	.003	.076	.052	.031	.018	.013	.010
MGLY	(PPB)	.003	.063	.044	.029	.021	.017	.015
HO2	(PPB)	.007	.028	.031	.027	.025	.024	.022
RO2S	(ug/m^3)	.010	.035	.067	.106	.113	.102	.084
RO2L	(ug/m^3)	.010	.010	.017	.024	.023	.019	.014
RAO2	(ug/m^3)	.010	.017	.030	.053	.059	.050	.036
KO2	(ug/m^3)	.010	.001	.003	.005	.006	.006	.004
RCO3	(ug/m^3)	.010	.013	.032	.071	.078	.063	.047
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 13

NO, NO2 CONC. SET AT 4.5, 6.5 PPB RESPECTIVELY (DIRTY DAY, JULY 3

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	1.140	1.120	1.085	1.050	1.025	1.005	.990
SO4	(ug/m^3)	64.000	64.100	64.200	64.400	64.500	64.550	64.600
NO	(PPB)	4.500	1.600	.518	.023	.003	.003	.004
NO2	(PPB)	6.530	5.715	2.320	.159	.046	.051	.062
O3	(PPB)	79.900	86.400	99.050	106.500	105.500	103.500	103.000
H2O2	(PPB)	.007	.013	.081	.653	.801	.794	.796
HNO3	(PPB)	4.030	6.010	7.825	8.335	8.305	8.265	8.240
PAN1	(PPB)	.002	1.275	3.200	4.835	4.995	5.060	5.100
PAN2	(PPB)	.002	.156	.542	.825	.824	.794	.763
C3H8	(PPB)	5.050	4.915	4.700	4.490	4.365	4.255	4.165
ALKA	(PPB)	17.400	15.950	13.850	11.950	11.000	10.145	9.450
ETHE	(PPB)	.009	.007	.005	.003	.003	.002	.002
ALKE	(PPB)	.006	.002	.000	.000	.000	.000	.000
AROM	(PPB)	2.040	1.420	.781	.420	.290	.204	.153
HCHO	(PPB)	3.400	2.875	2.665	2.175	1.360	.914	.719
ALD2	(PPB)	4.900	4.415	3.815	3.150	2.285	1.700	1.420
KET	(PPB)	2.000	2.590	3.435	4.060	4.080	4.065	4.080
HONO	(PPB)	.005	.046	.027	.002	.000	.000	.000
RNO3	(PPB)	.002	.273	.646	.900	.906	.900	.908
ROOH	(PPB)	.004	.008	.049	.666	2.465	4.150	5.470
CRES	(PPB)	.002	.055	.050	.032	.023	.017	.013
DIAL	(PPB)	.003	.322	.337	.201	.091	.046	.033
MGLY	(PPB)	.003	.234	.270	.174	.092	.064	.055
HO2	(PPB)	.007	.005	.021	.038	.012	.010	.012
RO2S	(ug/m^3)	.010	.008	.034	.188	.374	.387	.341
RO2L	(ug/m^3)	.010	.003	.012	.063	.230	.269	.210
RAO2	(ug/m^3)	.010	.006	.027	.166	.835	1.054	.771
KO2	(ug/m^3)	.010	.000	.001	.008	.047	.063	.049
RCO3	(ug/m^3)	.010	.004	.017	.157	1.045	1.076	.717
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 14

NO, NOX CONC. SET AT 2.7, 3.9 PPB RESPECTIVELY (DIRTY DAY, JULY 3)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	1.140	1.115	1.080	1.060	1.045	1.025	1.015
SO4	(ug/m^3)	64.000	64.100	64.200	64.300	64.400	64.500	64.500
NO	(PPB)	2.700	.596	.029	.001	.001	.001	.001
NO2	(PPB)	4.000	2.455	.182	.026	.030	.030	.028
O3	(PPB)	79.900	89.600	97.850	96.400	94.750	93.350	92.400
H2O2	(PPB)	.007	.051	.533	.669	.642	.609	.581
HNO3	(PPB)	4.030	5.405	5.915	5.895	5.865	5.835	5.815
PAN1	(PPB)	.002	1.685	3.400	3.555	3.610	3.670	3.715
PAN2	(PPB)	.002	.228	.587	.623	.607	.586	.567
C3H8	(PPB)	5.050	4.880	4.690	4.575	4.465	4.360	4.275
ALKA	(PPB)	17.400	15.550	13.700	12.750	11.800	10.950	10.250
ETHE	(PPB)	.009	.007	.005	.004	.003	.003	.002
ALKE	(PPB)	.006	.002	.000	.000	.000	.000	.000
AROM	(PPB)	2.040	1.275	.746	.544	.391	.284	.219
HCHO	(PPB)	3.400	2.895	2.355	1.455	.920	.631	.485
ALD2	(PPB)	4.900	4.285	3.605	2.670	1.915	1.415	1.145
KET	(PPB)	2.000	2.755	3.420	3.430	3.395	3.360	3.340
HONO	(PPB)	.005	.025	.002	.000	.000	.000	.000
RNO3	(PPB)	.002	.343	.630	.642	.633	.624	.622
ROOH	(PPB)	.004	.030	.488	2.235	3.945	5.405	6.530
CRES	(PPB)	.002	.060	.051	.042	.032	.024	.019
DIAL	(PPB)	.003	.359	.297	.137	.060	.031	.021
MGLY	(PPB)	.003	.270	.233	.111	.061	.045	.040
HO2	(PPB)	.007	.016	.038	.009	.005	.004	.003
RO2S	(ug/m^3)	.010	.025	.150	.359	.391	.392	.368
RO2L	(ug/m^3)	.010	.010	.059	.306	.449	.501	.487
RAO2	(ug/m^3)	.010	.021	.131	1.100	1.980	2.475	2.500
KO2	(ug/m^3)	.010	.001	.005	.045	.086	.113	.119
RCO3	(ug/m^3)	.010	.012	.112	1.495	2.085	2.100	1.850
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 15

NO, NOX CONC. SET AT 2., 3. PPB RESPECTIVELY (DIRTY DAY, JULY 3)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	1.140	1.110	1.090	1.070	1.055	1.035	1.025
SO4	(ug/m^3)	64.000	64.100	64.200	64.300	64.350	64.400	64.500
NO	(PPB)	2.000	.284	.000	.001	.001	.001	.000
NO2	(PPB)	3.000	1.315	.003	.022	.023	.022	.019
O3	(PPB)	79.900	90.050	93.350	91.650	89.950	88.550	87.600
H2O2	(PPB)	.007	.127	.626	.630	.597	.564	.535
HNO3	(PPB)	4.030	5.020	5.170	5.140	5.120	5.090	5.070
PAN1	(PPB)	.002	1.810	2.870	2.875	2.925	2.975	3.010
PAN2	(PPB)	.002	.250	.489	.493	.480	.464	.449
C3H8	(PPB)	5.050	4.865	4.730	4.625	4.525	4.420	4.345
ALKA	(PPB)	17.400	15.450	14.100	13.200	12.250	11.400	10.750
ETHE	(PPB)	.009	.007	.005	.004	.004	.003	.003
ALKE	(PPB)	.006	.002	.001	.000	.000	.000	.000
AROM	(PPB)	2.040	1.240	.845	.632	.463	.342	.268
HCHO	(PPB)	3.400	2.845	2.055	1.265	.809	.559	.428
ALD2	(PPB)	4.900	4.240	3.495	2.565	1.860	1.385	1.115
KET	(PPB)	2.000	2.785	3.150	3.115	3.075	3.040	3.015
HONO	(PPB)	.005	.013	.000	.000	.000	.000	.000
RNO3	(PPB)	.002	.354	.517	.512	.504	.496	.493
ROOH	(PPB)	.004	.079	.991	2.745	4.330	5.670	6.705
CRES	(PPB)	.002	.062	.057	.048	.037	.029	.023
DIAL	(PPB)	.003	.359	.257	.114	.051	.026	.017
MGLY	(PPB)	.003	.272	.190	.087	.050	.037	.032
HO2	(PPB)	.007	.027	.018	.006	.004	.003	.002
RO2S	(ug/m^3)	.010	.046	.260	.362	.384	.380	.354
RO2L	(ug/m^3)	.010	.019	.153	.418	.579	.646	.648
RAO2	(ug/m^3)	.010	.038	.395	1.575	2.605	3.300	3.565
KO2	(ug/m^3)	.010	.001	.013	.057	.098	.130	.146
RCO3	(ug/m^3)	.010	.022	.567	2.035	2.620	2.710	2.550
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 16

NO, NOX CONC. SET AT 1.6, 2.4 PPB RESPECTIVELY (DIRTY DAY, JULY 3

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	1.140	1.110	1.095	1.080	1.060	1.045	1.030
SO4	(ug/m^3)	64.000	64.100	64.200	64.300	64.300	64.400	64.450
NO	(PPB)	1.600	.153	.000	.001	.000	.000	.000
NO2	(PPB)	2.400	.766	.006	.018	.018	.018	.015
O3	(PPB)	79.900	89.400	90.250	88.500	86.900	85.500	84.500
H2O2	(PPB)	.007	.217	.600	.586	.554	.522	.496
HNO3	(PPB)	4.030	4.750	4.795	4.775	4.750	4.725	4.705
PAN1	(PPB)	.002	1.780	2.415	2.425	2.470	2.515	2.545
PAN2	(PPB)	.002	.245	.399	.403	.392	.378	.367
C3H8	(PPB)	5.050	4.875	4.765	4.665	4.560	4.465	4.385
ALKA	(PPB)	17.400	15.450	14.450	13.500	12.600	11.750	11.150
ETHE	(PPB)	.009	.007	.005	.005	.004	.003	.003
ALKE	(PPB)	.006	.002	.001	.000	.000	.000	.000
AROM	(PPB)	2.040	1.260	.928	.701	.520	.390	.309
HCHO	(PPB)	3.400	2.780	1.880	1.165	.753	.524	.400
ALD2	(PPB)	4.900	4.225	3.420	2.530	1.850	1.385	1.115
KET	(PPB)	2.000	2.755	2.940	2.910	2.870	2.835	2.810
HONO	(PPB)	.005	.007	.000	.000	.000	.000	.000
RNO3	(PPB)	.002	.340	.431	.426	.419	.413	.410
ROOH	(PPB)	.004	.146	1.330	3.015	4.510	5.780	6.755
CRES	(PPB)	.002	.062	.060	.052	.041	.032	.026
DIAL	(PPB)	.003	.348	.222	.099	.045	.023	.015
MGLY	(PPB)	.003	.261	.157	.074	.043	.032	.027
HO2	(PPB)	.007	.033	.012	.005	.003	.002	.002
RO2S	(ug/m^3)	.010	.065	.291	.359	.377	.371	.344
RO2L	(ug/m^3)	.010	.027	.226	.493	.672	.752	.763
RAO2	(ug/m^3)	.010	.055	.659	1.870	2.990	3.810	4.215
KO2	(ug/m^3)	.010	.001	.021	.061	.102	.136	.155
RCO3	(ug/m^3)	.010	.032	1.019	2.325	2.935	3.090	2.990
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 17

NO, NO2 CONC. SET AT 6.7, 3.5 PPB RESPECTIVELY (CLEAN DAY, JUNE 28

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	9.300	9.155	8.960	8.725	8.445	8.130	7.810
SO4	(ug/m^3)	12.000	12.600	13.350	14.300	15.400	16.650	17.950
NO	(PPB)	6.610	4.035	3.245	2.415	1.645	1.000	.567
NO2	(PPB)	3.460	4.715	4.015	3.260	2.515	1.800	1.224
O3	(PPB)	30.300	30.600	33.200	36.350	40.050	44.450	48.950
H2O2	(PPB)	.007	.007	.007	.007	.009	.018	.050
HNO3	(PPB)	.612	1.730	3.025	4.370	5.655	6.760	7.540
PAN1	(PPB)	.002	.076	.187	.331	.504	.709	.916
PAN2	(PPB)	.002	.017	.048	.080	.105	.119	.122
C3H8	(PPB)	2.460	2.415	2.345	2.270	2.180	2.075	1.970
ALKA	(PPB)	3.390	3.180	2.910	2.610	2.295	1.965	1.670
ETHE	(PPB)	.009	.007	.006	.004	.003	.002	.001
ALKE	(PPB)	.006	.003	.001	.001	.000	.000	.000
AROM	(PPB)	.422	.317	.218	.136	.077	.040	.020
HCHO	(PPB)	2.000	1.445	1.135	1.000	.967	.980	.984
ALD2	(PPB)	.400	.505	.582	.627	.637	.617	.583
KET	(PPB)	1.300	1.385	1.490	1.610	1.740	1.855	1.960
HONO	(PPB)	.005	.080	.083	.079	.067	.050	.030
RNO3	(PPB)	.002	.046	.097	.152	.206	.253	.289
ROOH	(PPB)	.004	.004	.004	.004	.005	.008	.017
CRES	(PPB)	.002	.012	.013	.010	.006	.003	.002
DIAL	(PPB)	.003	.059	.071	.058	.039	.023	.012
MGLY	(PPB)	.003	.043	.052	.046	.033	.021	.013
HO2	(PPB)	.007	.001	.001	.002	.003	.006	.011
RO2S	(ug/m^3)	.010	.001	.001	.002	.003	.007	.012
RO2L	(ug/m^3)	.010	.000	.000	.000	.001	.001	.001
RAO2	(ug/m^3)	.010	.000	.001	.001	.001	.002	.004
KO2	(ug/m^3)	.010	.000	.000	.000	.000	.000	.001
RCO3	(ug/m^3)	.010	.000	.001	.001	.001	.003	.004
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 18

NO, NO2 CONC. SET AT 7.5, 4.5 PPB RESPECTIVELY (CLEAN DAY, JUNE 2

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	9.300	9.175	9.010	8.820	8.605	8.370	8.160
SO4	(ug/m^3)	12.000	12.500	13.150	13.900	14.750	15.650	16.550
NO	(PPB)	7.400	4.895	4.125	3.300	2.510	1.820	1.295
NO2	(PPB)	4.440	5.625	4.920	4.195	3.490	2.840	2.310
O3	(PPB)	30.300	30.200	32.300	34.650	37.250	40.200	43.200
H2O2	(PPB)	.007	.007	.007	.006	.007	.008	.011
HNO3	(PPB)	.612	1.745	3.055	4.420	5.735	6.895	7.805
PAN1	(PPB)	.002	.065	.155	.267	.392	.525	.650
PAN2	(PPB)	.002	.014	.039	.067	.089	.103	.108
C3H8	(PPB)	2.460	2.420	2.365	2.300	2.230	2.155	2.085
ALKA	(PPB)	3.390	3.205	2.985	2.730	2.470	2.215	1.995
ETHE	(PPB)	.009	.007	.006	.005	.004	.003	.002
ALKE	(PPB)	.006	.003	.002	.001	.000	.000	.000
AROM	(PPB)	.422	.331	.242	.165	.107	.067	.043
HCHO	(PPB)	2.000	1.445	1.125	.964	.911	.905	.911
ALD2	(PPB)	.400	.493	.567	.614	.636	.636	.623
KET	(PPB)	1.300	1.375	1.460	1.560	1.660	1.755	1.835
HONO	(PPB)	.005	.083	.087	.084	.075	.062	.044
RNO3	(PPB)	.002	.040	.084	.131	.176	.218	.250
ROOH	(PPB)	.004	.004	.004	.004	.004	.005	.006
CRES	(PPB)	.002	.011	.014	.012	.008	.005	.003
DIAL	(PPB)	.003	.054	.069	.062	.047	.032	.021
MGLY	(PPB)	.003	.038	.049	.046	.037	.027	.018
HO2	(PPB)	.007	.001	.001	.001	.002	.002	.003
RO2S	(ug/m^3)	.010	.001	.001	.001	.002	.003	.004
RO2L	(ug/m^3)	.010	.000	.000	.000	.000	.000	.000
RAO2	(ug/m^3)	.010	.000	.000	.000	.001	.001	.001
KO2	(ug/m^3)	.010	.000	.000	.000	.000	.000	.000
RCO3	(ug/m^3)	.010	.000	.000	.001	.001	.001	.001
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 19

BASE LINE RUN (AS PER MEMO DATED JAN 23, 87) (CLEAN DAY, JUNE 28)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	9.300	9.160	8.980	8.765	8.520	8.250	7.975
SO4	(ug/m^3)	12.000	12.600	13.300	14.150	15.150	16.200	17.250
NO	(PPB)	7.500	4.755	3.810	2.845	1.970	1.240	.737
NO2	(PPB)	4.510	5.690	4.905	4.050	3.175	2.345	1.650
O3	(PPB)	30.300	31.300	34.650	38.350	42.450	47.300	52.050
H2O2	(PPB)	.007	.007	.007	.007	.009	.014	.032
HNO3	(PPB)	.612	1.895	3.360	4.860	6.275	7.490	8.370
PAN1	(PPB)	.002	.108	.266	.465	.700	.970	1.245
PAN2	(PPB)	.002	.023	.067	.114	.152	.175	.184
C3H8	(PPB)	3.700	3.625	3.535	3.425	3.305	3.170	3.035
ALKA	(PPB)	5.110	4.795	4.425	4.010	3.580	3.135	2.740
ETHE	(PPB)	.014	.012	.010	.008	.006	.004	.003
ALKE	(PPB)	.009	.005	.002	.001	.000	.000	.000
AROM	(PPB)	.634	.483	.340	.222	.135	.077	.043
HCHO	(PPB)	3.000	2.115	1.590	1.335	1.230	1.205	1.200
ALD2	(PPB)	.602	.751	.863	.929	.951	.936	.898
KET	(PPB)	1.950	2.075	2.225	2.385	2.555	2.715	2.855
HONO	(PPB)	.005	.090	.090	.083	.070	.053	.033
RNO3	(PPB)	.002	.065	.138	.214	.288	.356	.409
ROOH	(PPB)	.004	.004	.004	.005	.005	.007	.014
CRES	(PPB)	.003	.018	.020	.016	.011	.006	.004
DIAL	(PPB)	.003	.086	.105	.090	.064	.041	.024
MGLY	(PPB)	.003	.062	.076	.068	.052	.036	.023
HO2	(PPB)	.007	.001	.001	.002	.003	.005	.008
RO2S	(ug/m^3)	.010	.001	.001	.002	.003	.006	.010
RO2L	(ug/m^3)	.010	.000	.000	.001	.001	.001	.001
RAO2	(ug/m^3)	.010	.000	.001	.001	.001	.002	.004
KO2	(ug/m^3)	.010	.000	.000	.000	.000	.000	.001
RCO3	(ug/m^3)	.010	.000	.001	.001	.002	.003	.004
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 20

NO, NOX CONC. SET AT 9.8, 14.7 PPB RESPECTIVELY (DIRTY DAY, JULY 3

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	1.140	1.130	1.115	1.090	1.060	1.020	.988
SO4	(ug/m^3)	64.000	64.050	64.100	64.200	64.350	64.450	64.650
NO	(PPB)	9.770	5.020	3.855	2.575	1.400	.546	.160
NO2	(PPB)	14.700	15.850	12.650	9.165	5.695	2.690	.984
O3	(PPB)	79.900	79.800	85.550	92.800	102.400	113.500	121.500
H2O2	(PPB)	.007	.007	.008	.010	.021	.104	.412
HNO3	(PPB)	4.030	6.675	9.790	13.000	15.900	17.850	18.600
PAN1	(PPB)	.002	.681	1.565	2.640	3.930	5.425	6.560
PAN2	(PPB)	.002	.066	.234	.457	.678	.845	.909
C3H8	(PPB)	5.050	4.975	4.875	4.735	4.560	4.345	4.155
ALKA	(PPB)	17.400	16.550	15.500	14.200	12.600	10.800	9.380
ETHE	(PPB)	.009	.008	.007	.005	.004	.003	.002
ALKE	(PPB)	.006	.003	.001	.000	.000	.000	.000
AROM	(PPB)	2.040	1.680	1.270	.865	.520	.273	.150
HCHO	(PPB)	3.400	2.755	2.460	2.395	2.440	2.430	2.275
ALD2	(PPB)	4.900	4.600	4.245	3.875	3.500	3.120	2.770
KET	(PPB)	2.000	2.320	2.745	3.285	3.915	4.595	5.070
HONO	(PPB)	.005	.074	.078	.073	.055	.029	.008
RNO3	(PPB)	.002	.153	.359	.605	.876	1.135	1.295
ROOH	(PPB)	.004	.004	.005	.006	.013	.062	.306
CRES	(PPB)	.002	.041	.054	.048	.033	.019	.011
DIAL	(PPB)	.003	.220	.317	.309	.238	.148	.084
MGLY	(PPB)	.003	.150	.216	.222	.185	.128	.081
HO2	(PPB)	.007	.001	.002	.003	.007	.020	.031
RO2S	(ug/m^3)	.010	.001	.003	.005	.012	.035	.084
RO2L	(ug/m^3)	.010	.001	.001	.002	.003	.008	.017
TAO2	(ug/m^3)	.010	.001	.002	.004	.008	.025	.053
KO2	(ug/m^3)	.010	.000	.000	.000	.000	.002	.004
RCO3	(ug/m^3)	.010	.001	.001	.003	.006	.017	.049
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 21

NO, NOX CONC. SET AT 11.0, 16.5 PPB RESPECTIVELY (DIRTY DAY, JULY

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	1.140	1.130	1.120	1.095	1.075	1.040	1.013
SO4	(ug/m^3)	64.000	64.000	64.100	64.200	64.300	64.400	64.550
NO	(PPB)	11.000	5.810	4.675	3.400	2.170	1.179	.551
NO2	(PPB)	16.500	18.100	14.900	11.550	8.180	5.130	2.830
O3	(PPB)	79.900	78.850	83.400	89.400	97.300	107.000	116.000
H2O2	(PPB)	.007	.007	.007	.008	.012	.028	.105
HNO3	(PPB)	4.030	6.740	9.910	13.300	16.400	18.950	20.500
PAN1	(PPB)	.002	.617	1.390	2.310	3.345	4.500	5.625
PAN2	(PPB)	.002	.058	.203	.395	.589	.745	.836
C3H8	(PPB)	5.050	4.985	4.890	4.780	4.630	4.455	4.275
ALKA	(PPB)	17.400	16.650	15.700	14.600	13.200	11.700	10.305
ETHE	(PPB)	.009	.008	.007	.006	.004	.003	.002
ALKE	(PPB)	.006	.003	.001	.000	.000	.000	.000
AROM	(PPB)	2.040	1.710	1.340	.962	.637	.386	.226
HCHO	(PPB)	3.400	2.740	2.415	2.325	2.355	2.405	2.400
ALD2	(PPB)	4.900	4.625	4.295	3.960	3.630	3.315	3.025
KET	(PPB)	2.000	2.285	2.665	3.130	3.665	4.240	4.760
HONO	(PPB)	.005	.077	.083	.080	.067	.047	.024
RNO3	(PPB)	.002	.139	.323	.541	.778	1.013	1.205
ROOH	(PPB)	.004	.004	.004	.005	.008	.017	.063
CRES	(PPB)	.002	.038	.053	.050	.037	.024	.014
DIAL	(PPB)	.003	.204	.301	.310	.259	.185	.119
MGLY	(PPB)	.003	.138	.201	.213	.190	.146	.101
HO2	(PPB)	.007	.001	.001	.002	.004	.009	.017
RO2S	(ug/m^3)	.010	.001	.002	.003	.006	.014	.031
RO2L	(ug/m^3)	.010	.000	.001	.001	.002	.003	.006
RAO2	(ug/m^3)	.010	.001	.001	.002	.004	.010	.021
KO2	(ug/m^3)	.010	.000	.000	.000	.000	.001	.001
RCO3	(ug/m^3)	.010	.001	.001	.002	.004	.007	.016
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 22

BASE LINE RUN (AS PER MEMO DATED : JAN 23, 87) (DIRTY DAY, JUL

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	1.140	1.135	1.120	1.105	1.085	1.055	1.030
SO4	(ug/m^3)	64.000	64.000	64.100	64.200	64.250	64.350	64.450
NO	(PPB)	13.500	7.000	5.610	4.085	2.645	1.495	.731
NO2	(PPB)	19.500	21.950	18.450	14.550	10.650	6.985	4.065
O3	(PPB)	79.900	79.350	85.650	93.700	104.000	115.000	126.500
H2O2	(PPB)	.007	.007	.007	.008	.012	.025	.075
HNO3	(PPB)	4.030	6.960	10.400	14.050	17.500	20.200	22.000
PAN1	(PPB)	.002	.822	1.855	3.075	4.455	5.970	7.445
PAN2	(PPB)	.002	.072	.255	.508	.775	1.007	1.165
C3H8	(PPB)	7.490	7.405	7.290	7.135	6.955	6.740	6.525
ALKA	(PPB)	26.000	25.050	23.850	22.350	20.600	18.650	16.800
ETHE	(PPB)	.014	.013	.011	.009	.008	.006	.005
ALKE	(PPB)	.009	.005	.002	.001	.000	.000	.000
AROM	(PPB)	3.000	2.560	2.065	1.560	1.100	.726	.470
HCHO	(PPB)	5.110	4.045	3.460	3.220	3.175	3.190	3.170
ALD2	(PPB)	7.330	6.940	6.500	6.035	5.590	5.170	4.795
KET	(PPB)	3.000	3.380	3.880	4.490	5.180	5.925	6.610
HONO	(PPB)	.005	.084	.089	.084	.069	.049	.027
RNO3	(PPB)	.002	.187	.432	.725	1.043	1.365	1.640
ROOH	(PPB)	.004	.004	.004	.005	.008	.016	.050
CRES	(PPB)	.003	.052	.073	.072	.058	.040	.026
DIAL	(PPB)	.003	.273	.417	.448	.399	.312	.222
MGLY	(PPB)	.003	.183	.273	.299	.278	.230	.173
HO2	(PPB)	.007	.001	.001	.002	.004	.007	.014
RO2S	(ug/m^3)	.010	.001	.002	.003	.006	.013	.027
RO2L	(ug/m^3)	.010	.000	.001	.001	.002	.004	.006
RAO2	(ug/m^3)	.010	.001	.001	.003	.005	.009	.019
KO2	(ug/m^3)	.010	.000	.000	.000	.000	.000	.001
RCO3	(ug/m^3)	.010	.001	.001	.002	.004	.007	.014
NH3	(PPB)	.014	.014	.014	.014	.014	.014	.014
DUST	(ug/m^3)	.010	.010	.010	.010	.010	.010	.010

Run 23

NO, NO2 COND AT 2.5, 1.5 PPB TEST RUN (CLEAN DAY, JUNE 28 1984)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	8.999	8.674	8.441	8.247	8.071	7.913	7.787
SO4	(ug/m^3)	25.000	26.286	27.229	28.014	28.700	29.314	29.843
NO	(PPB)	0.188	0.070	0.023	0.010	0.009	0.010	0.012
NO2	(PPB)	0.562	0.226	0.081	0.036	0.035	0.039	0.045
O3	(PPB)	42.200	45.243	46.029	45.757	45.229	44.829	44.614
H2O2	(PPB)	1.313	1.616	2.041	2.417	2.704	2.933	3.097
HNO3	(PPB)	0.562	0.754	0.808	0.823	0.829	0.836	0.842
PAN1	(PPB)	0.002	0.194	0.299	0.329	0.321	0.307	0.291
PAN2	(PPB)	0.002	0.017	0.025	0.026	0.023	0.020	0.017
C3H8	(PPB)	0.920	0.876	0.844	0.818	0.795	0.774	0.757
ALKA	(PPB)	2.440	2.091	1.864	1.690	1.543	1.421	1.330
ETHE	(PPB)	0.009	0.006	0.005	0.004	0.003	0.002	0.002
ALKE	(PPB)	0.006	0.002	0.001	0.000	0.000	0.000	0.000
AROM	(PPB)	0.094	0.049	0.030	0.020	0.014	0.010	0.007
HCHO	(PPB)	1.677	1.249	0.679	0.615	0.447	0.363	0.332
ALD2	(PPB)	0.375	0.430	0.395	0.330	0.272	0.238	0.226
KET	(PPB)	1.219	1.320	1.364	1.369	1.364	1.360	1.354
HONO	(PPB)	0.005	0.004	0.001	0.000	0.000	0.000	0.000
RNO3	(PPB)	0.002	0.059	0.086	0.099	0.105	0.110	0.115
ROOH	(PPB)	0.004	0.126	0.371	0.742	1.147	1.490	1.740
CRES	(PPB)	0.002	0.003	0.002	0.002	0.001	0.001	0.001
DIAL	(PPB)	0.003	0.017	0.012	0.007	0.004	0.003	0.002
MGLY	(PPB)	0.003	0.016	0.014	0.013	0.013	0.012	0.010
HO2	(PPB)	0.007	0.032	0.034	0.033	0.031	0.029	0.026
RO2S	(ug/m^3)	0.010	0.044	0.075	0.098	0.103	0.094	0.079
RO2L	(ug/m^3)	0.010	0.004	0.006	0.007	0.007	0.006	0.005
RAO2	(ug/m^3)	0.010	0.019	0.031	0.041	0.042	0.035	0.027
KO2	(ug/m^3)	0.010	0.002	0.003	0.005	0.006	0.005	0.004
RCO3	(ug/m^3)	0.010	0.011	0.027	0.044	0.048	0.041	0.033
NH3	(PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	(ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

SARNIA RUN 7 JULY 1984

Run 24

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	2.360	2.271	2.177	2.100	2.079	1.984	1.939
SO4	(ug/m 3)	6.000	6.349	6.720	7.011	7.257	7.466	7.633
NO	(PPB)	0.566	0.284	0.115	0.068	0.051	0.047	0.045
NO2	(PPB)	1.227	0.657	0.337	0.218	0.174	0.164	0.166
O3	(PPB)	28.300	33.700	38.343	40.957	42.586	43.771	44.757
HCO2	(PPB)	0.849	0.837	1.0[illegible]	1.394	1.736	2.020	2.226
HNO3	(PPB)	0.567	1.019	1.297	1.[illegible]21	1.533	1.559	1.604
PAN1	(PPB)	0.002	0.328	0.501	0.[illegible]22	0.488	0.437	0.386
PAN2	(PPB)	0.002	0.003	0.003	0.[illegible]02	0.001	0.001	0.001
C3H8	(PPB)	1.623	1.534	1.444	1.374	1.313	1.269	1.229
ALKA	(PPB)	2.264	1.909	1.576	1.350	1.179	1.049	0.950
ETHE	(PPB)	0.009	0.006	0.004	0.003	0.002	0.002	0.001
ALKE	(PPB)	0.006	0.002	0.000	0.000	0.000	0.000	0.000
AROM	(PPB)	0.003	0.001	0.001	0.000	0.000	0.000	0.000
HCHO	(PPB)	1.414	1.331	1.191	1.024	0.894	0.802	0.752
ALD2	(PPB)	1.226	0.856	0.622	0.494	0.415	0.364	0.336
KET	(PPB)	0.472	0.638	0.777	0.857	0.909	0.943	0.966
HCNO	(PPB)	0.005	0.017	0.006	0.003	0.002	0.002	0.001
RNO3	(PPB)	0.002	0.063	0.110	0.135	0.151	0.160	0.166
ROOH	(PPB)	0.004	0.030	0.146	0.355	0.593	0.818	0.995
CRES	(PPB)	0.002	0.000	0.000	0.000	0.000	0.000	0.000
DIAL	(PPB)	0.003	0.001	0.000	0.000	0.000	0.000	0.000
MGLY	(PPB)	0.003	0.001	0.001	0.002	0.003	0.003	0.003
HO2	(PPB)	0.007	0.020	0.031	0.035	0.035	0.033	0.029
RO2S	(ug/m 3)	0.010	0.026	0.048	0.067	0.066	0.065	0.057
RO2L	(ug/m 3)	0.010	0.000	0.001	0.001	0.001	0.001	0.001
RAD2	(ug/m 3)	0.010	0.008	0.013	0.015	0.015	0.013	0.011
XO2	(ug/m 3)	0.010	0.000	0.001	0.001	0.002	0.002	0.002
RCO3	(ug/m 3)	0.010	0.010	0.018	0.025	0.026	0.026	0.022
NH3	(PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	(ug/m 3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 25

SARNIA RUN 8 JULY 1984 (RL = 1)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	10.276	10.177	10.006	9.820	9.879	9.827	9.791
SO4	(ug/m^3)	6.000	6.634	7.623	7.871	8.169	8.337	8.467
NO	(PPB)	2.113	0.776	0.155	0.064	0.001	0.000	0.000
NO2	(PPB)	2.023	1.720	0.544	0.121	0.012	0.011	0.009
O3	(PPB)	27.571	39.471	50.429	52.890	52.229	51.671	51.300
H2O2	(PPB)	0.921	0.891	1.031	1.349	1.344	1.306	1.267
HNO3	(PPB)	0.552	1.131	1.444	1.474	1.471	1.469	1.463
PAN1	(PPB)	0.002	0.405	1.250	1.659	1.673	1.684	1.697
PAN2	(PPB)	0.002	0.118	0.341	0.445	0.451	0.446	0.440
C3H6	(PPB)	18.671	18.229	17.814	17.643	17.543	17.443	17.386
ALKA	(PPB)	35.343	32.771	30.486	29.514	28.971	28.500	28.157
ETHE	(PPB)	0.008	0.007	0.006	0.005	0.005	0.005	0.004
ALKE	(PPB)	0.552	0.262	0.121	0.073	0.050	0.035	0.025
AROM	(PPB)	2.207	1.583	1.148	0.997	0.919	0.856	0.811
HCHO	(PPB)	3.220	2.569	2.610	2.014	1.430	1.050	0.812
ALD2	(PPB)	0.552	2.644	3.806	3.870	3.551	3.289	3.106
MET	(PPB)	0.460	1.681	2.720	3.023	3.017	3.004	2.989
HONO	(PPB)	0.005	0.023	0.005	0.000	0.000	0.000	0.000
RNO3	(PPB)	0.002	0.523	0.960	1.090	1.090	1.089	1.087
ROOH	(PPB)	0.004	0.020	0.132	0.714	1.580	2.276	2.773
CRES	(PPB)	0.002	0.063	0.068	0.065	0.063	0.060	0.059
DIAL	(PPB)	0.003	0.334	0.357	0.267	0.172	0.114	0.079
MGLY	(PPB)	0.003	0.243	0.255	0.166	0.089	0.051	0.032
HCL	(PPB)	0.006	0.011	0.026	0.017	0.005	0.003	0.002
RO2R	(ug/m^3)	0.010	0.019	0.061	0.203	0.309	0.321	0.301
RO2L	(ug/m^3)	0.010	0.006	0.019	0.065	0.210	0.306	0.378
RAD2	(ug/m^3)	0.010	0.020	0.059	0.291	0.974	1.547	1.971
HO2	(ug/m^3)	0.010	0.000	0.001	0.004	0.015	0.025	0.032
RCO3	(ug/m^3)	0.010	0.006	0.022	0.258	0.965	1.373	1.641
NH3	(PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	(ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 26

SARNIA RUN 8 JULY 1984 (RUN 2)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	10.376	10.267	10.036	9.794	9.483	9.301	9.203
SO4	(ug/m^3)	6.000	6.514	7.383	8.484	9.751	10.357	10.957
NO	(PPB)	7.301	4.383	2.709	1.230	0.309	0.036	0.005
NO2	(PPB)	7.357	8.129	6.297	3.740	1.303	0.210	0.044
O3	(PPB)	36.771	41.300	53.014	66.414	78.457	82.829	83.025
H2O2	(PPB)	0.921	0.875	0.821	0.777	0.878	1.279	1.473
HNO3	(PPB)	0.552	2.090	4.107	5.979	7.051	7.259	7.259
PAN1	(PPB)	0.002	0.241	0.904	1.959	3.214	3.933	4.096
PAN2	(PPB)	0.002	0.197	0.824	1.719	2.556	2.919	2.950
C3HB	(PPB)	3.124	3.076	3.003	2.907	2.794	2.727	2.693
ALKA	(PPB)	12.857	12.229	11.329	10.229	9.043	8.351	8.034
ETHE	(PPB)	0.008	0.007	0.006	0.005	0.003	0.003	0.002
ALKE	(PPB)	0.221	0.126	0.056	0.019	0.006	0.002	0.001
AROM	(PPB)	7.173	5.776	4.127	2.636	1.553	1.084	0.916
HCHO	(PPB)	3.220	2.549	2.281	2.179	2.010	1.644	1.264
ALD2	(PPB)	0.552	1.018	1.460	1.760	1.867	1.767	1.600
KET	(PPB)	0.460	0.723	1.103	1.560	2.027	2.239	2.271
HONO	(PPB)	0.005	0.089	0.080	0.051	0.017	0.002	0.000
RNO3	(PPB)	0.002	0.138	0.247	0.593	0.815	0.907	0.919
ROOH	(PPB)	0.004	0.004	0.006	0.015	0.103	0.564	1.352
CRES	(PPB)	0.002	0.161	0.216	0.176	0.114	0.083	0.072
DIAL	(PPB)	0.003	0.837	1.194	1.080	0.764	0.500	0.334
MGLY	(PPB)	0.003	0.589	0.863	0.832	0.625	0.396	0.240
HO2	(PPB)	0.006	0.002	0.004	0.009	0.026	0.028	0.017
RO2S	(ug/m^3)	0.010	0.001	0.003	0.009	0.036	0.109	0.163
RO2L	(ug/m^3)	0.010	0.003	0.006	0.014	0.037	0.124	0.225
RAO2	(ug/m^3)	0.010	0.001	0.002	0.006	0.025	0.086	0.159
KO2	(ug/m^3)	0.010	0.000	0.000	0.000	0.001	0.004	0.007
RCO3	(ug/m^3)	0.010	0.001	0.003	0.008	0.026	0.168	0.352
NH3	(PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	(ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 27

SARNIA RUN 14 JULY 1984

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	26.171	25.586	24.943	24.286	24.257	23.914	23.629
SO4	(ug/m 3)	54.000	56.300	58.700	60.171	61.214	62.757	63.871
NO	(PPB)	0.841	0.791	0.113	0.022	0.016	0.018	0.022
NO2	(PPB)	5.410	4.611	1.039	0.391	1.242	0.275	0.334
O3	(PPB)	75.243	98.429	114.286	118.100	119.143	120.000	121.371
H2O2	(PPB)	1.881	1.853	2.464	3.119	3.390	3.570	3.737
HNO3	(PPB)	0.565	2.644	3.671	3.834	3.901	3.961	4.031
PAN1	(PPB)	0.002	1.814	3.936	4.361	4.354	4.290	4.189
PAN2	(PPB)	0.002	0.431	1.039	1.126	1.056	0.964	0.874
C3H6	(PPB)	1.413	1.364	1.317	1.286	1.254	1.234	1.207
ALKA	(PPB)	34.714	31.314	27.943	26.014	24.400	22.943	21.771
ETHE	(PPB)	0.943	0.744	0.573	0.483	0.413	0.357	0.314
ALKE	(PPB)	2.167	0.649	0.162	0.052	0.018	0.006	0.003
AROM	(PPB)	4.896	3.224	2.043	1.540	1.199	0.951	0.782
HCHO	(PPB)	3.294	4.636	4.757	3.840	3.021	2.527	2.315
ALD2	(PPB)	3.857	6.104	6.490	5.784	4.994	4.400	4.049
KET	(PPB)	8.846	10.014	11.029	11.286	11.357	11.394	11.460
HONO	(PPB)	0.005	0.031	0.006	0.001	0.001	0.001	0.001
RNO3	(PPB)	0.002	0.607	1.124	1.279	1.357	1.420	1.476
ROOH	(PPB)	0.004	0.075	0.839	3.224	5.917	8.199	9.903
CRES	(PPB)	0.002	0.125	0.113	0.098	0.083	0.069	0.057
DIAL	(PPB)	0.003	0.819	0.773	0.509	0.329	0.228	0.174
MGLY	(PPB)	0.003	0.614	0.606	0.402	0.276	0.210	0.171
HO2	(PPB)	0.007	0.023	0.050	0.033	0.026	0.024	0.023
RO2R	(ug/m 3)	0.010	0.039	0.158	0.343	0.380	0.363	0.320
RO2L	(ug/m 3)	0.010	0.019	0.078	0.280	0.432	0.516	0.546
RAO2	(ug/m 3)	0.010	0.031	0.122	0.626	1.233	1.723	2.004
NO2	(ug/m 3)	0.010	0.002	0.008	0.041	0.064	0.120	0.142
RCO3	(ug/m 3)	0.010	0.019	0.122	0.920	1.517	1.812	1.886
NH3	(PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	(ug/m 3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 28

SAPRC RUN 16 JULY 1984

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	0.004	0.004	0.004	0.004	0.004	0.004	0.004
SULF	(ug/m^3)	4.000	4.000	4.000	4.000	4.000	4.000	4.000
NO	(PPB)	1.036	0.164	0.045	0.016	0.011	0.010	0.012
NO2	(PPB)	0.282	0.445	0.159	0.070	0.051	0.050	0.057
O3	(PPB)	23.227	33.829	37.100	37.986	38.214	38.343	38.600
HCHO	(PPB)	0.847	0.906	1.149	1.376	1.516	1.609	1.686
PHOT	(PPB)	0.560	0.826	0.908	1.927	0.934	0.940	0.945
PAN1	(PPB)	0.002	0.181	0.369	0.414	0.405	0.381	0.350
PAN2	(PPB)	0.002	0.022	0.033	0.032	0.027	0.022	0.018
C3H8	(PPB)	0.207	0.198	0.193	0.189	0.185	0.182	0.180
ALKA	(PPB)	12.614	11.071	10.069	9.459	8.953	8.529	8.201
ETHE	(PPB)	0.009	0.007	0.005	0.005	0.004	0.004	0.003
ALKE	(PPB)	0.006	0.002	0.001	0.000	0.000	0.000	0.000
ARO1	(PPB)	0.207	0.121	0.083	0.064	0.051	0.042	0.036
HCHO	(PPB)	0.659	0.893	0.965	0.850	0.720	0.634	0.596
ALD2	(PPB)	0.006	1.067	1.366	1.351	1.266	1.198	1.167
KET	(PPB)	0.003	0.614	0.944	1.088	1.173	1.240	1.297
HONO	(PPB)	0.005	0.006	0.001	0.000	0.000	0.000	0.000
RNO3	(PPB)	0.002	0.248	0.377	0.432	0.464	0.489	0.511
ROOH	(PPB)	0.004	0.086	0.356	0.856	1.446	1.983	2.396
CRES	(PPB)	0.002	0.007	0.006	0.005	0.004	0.003	0.003
DIAL	(PPB)	0.003	0.038	0.031	0.022	0.016	0.012	0.010
MGLY	(PPB)	0.003	0.030	0.025	0.019	0.015	0.013	0.011
HO2	(PPB)	0.007	0.022	0.028	0.024	0.021	0.020	0.018
RO2S	(ug/m^3)	0.016	0.040	0.081	0.129	0.144	0.138	0.117
RO2L	(ug/m^3)	0.010	0.004	0.009	0.018	0.021	0.019	0.014
RAO2	(ug/m^3)	0.010	0.044	0.079	0.149	0.136	0.169	0.121
KO2	(ug/m^3)	0.010	0.000	0.001	0.003	0.004	0.004	0.003
RCO3	(ug/m^3)	0.010	0.012	0.040	0.099	0.128	0.118	0.090
NH3	(PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	(ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 29

SARNIA RUN 17 JULY 1984

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	PPB)	4.636	4.620	4.576	4.521	4.461	4.400	4.34[illegible]
SO4	ug/m^3)	0.000	5.134	5.317	5.536	5.780	6.026	6.247
NO	PPB)	4.657	8.346	7.456	6.363	5.224	4.173	3.297
NO2	PPB)	18.614	13.243	12.071	10.913	9.774	8.727	7.92[illegible]
O3	PPB)	27.986	33.800	35.826	38.429	41.229	44.271	47.20[illegible]
H2O2	PPB)	0.931	0.892	0.848	0.802	0.758	0.717	0.683
HNO3	PPB)	0.359	1.976	3.739	5.680	7.624	9.407	10.831
PAN1	PPB)	0.002	0.123	0.280	0.467	0.671	0.873	1.040
PAN2	PPB)	0.002	0.011	0.033	0.062	0.090	0.111	0.123
C3H6	PPB)	3.817	3.783	3.731	3.673	3.606	3.537	3.480
ALKA	PPB)	12.486	12.114	11.600	11.057	10.436	9.846	9.349
ETHE	PPB)	0.019	0.017	0.016	0.014	0.012	0.010	0.009
ALKE	PPB)	0.186	0.126	0.078	0.044	0.024	0.013	0.007
AROM	PPB)	0.708	0.623	0.523	0.422	0.334	0.263	0.212
HCHO	PPB)	1.489	1.339	1.307	1.359	1.449	1.547	1.626
ALD2	PPB)	1.490	1.697	1.693	2.050	2.154	2.213	2.237
KET	PPB)	3.257	3.784	3.556	3.756	3.966	4.167	4.331
HONO	PPB)	0.005	0.092	0.103	0.105	0.098	0.084	0.065
RNO3	PPB)	0.002	0.072	0.164	0.269	0.376	0.476	0.559
ROOH	PPB)	0.004	0.004	0.004	0.004	0.004	0.004	0.004
CRES	PPB)	0.002	0.012	0.019	0.021	0.020	0.017	0.014
DIAL	PPB)	0.003	0.036	0.091	0.103	0.099	0.087	0.074
MGLY	PPB)	0.003	0.039	0.060	0.069	0.067	0.060	0.051
HO2	PPB)	0.007	0.000	0.000	0.001	0.001	0.001	0.001
RO2S	ug/m^3)	0.010	0.000	0.001	0.001	0.001	0.002	0.002
RO2L	ug/m^3)	0.010	0.000	0.000	0.000	0.000	0.000	0.000
RACC	ug/m^3)	0.010	0.000	0.000	0.001	0.001	0.001	0.001
RO2	ug/m^3)	0.010	0.000	0.000	0.000	0.000	0.000	0.000
RCO3	ug/m^3)	0.010	0.000	0.000	0.000	0.001	0.001	0.001
NH3	PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 30

SARMA RUN 18 JULY 1984 RUN 1

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	PPB)	2.251	2.190	2.159	2.134	2.113	2.094	2.080
SO4	ug/m^3)	17.000	17.229	17.400	17.500	17.557	17.629	17.700
NO	PPB)	0.973	0.112	0.011	0.001	0.001	0.001	0.001
NO2	PPB)	0.068	0.281	0.039	0.008	0.009	0.008	0.008
O3	(PPB)	28.114	32.929	34.486	33.971	33.630	32.929	32.071
H2O2	(PPB)	0.937	1.064	1.334	1.394	1.370	1.337	1.306
HNO3	(PPB)	0.562	0.743	0.776	0.775	0.772	0.770	0.768
PAN1	(PPB)	0.002	0.177	0.362	0.392	0.398	0.404	0.408
PAN2	(PPB)	0.002	0.052	0.094	0.098	0.094	0.090	0.086
C3H8	(PPB)	4.687	4.531	4.449	4.391	4.334	4.289	4.250
ALKA	(PPB)	12.114	10.886	10.229	9.817	9.443	9.116	8.876
ETHE	(PPB)	0.006	0.006	0.005	0.005	0.004	0.004	0.004
ALKE	(PPB)	0.094	0.036	0.019	0.012	0.007	0.005	0.003
AROM	(PPB)	0.563	0.354	0.271	0.227	0.191	0.164	0.145
HCHO	(PPB)	0.939	0.948	0.808	0.558	0.391	0.291	0.234
ALD2	(PPB)	0.005	0.905	1.084	0.941	0.797	0.697	0.640
KET	(PPB)	0.003	0.535	0.754	0.777	0.781	0.785	0.792
HONO	(PPB)	0.005	0.004	0.000	0.000	0.000	0.000	0.000
RNO3	(PPB)	0.002	0.231	0.323	0.332	0.331	0.332	0.334
ROOH	(PPB)	0.004	0.099	0.386	0.974	1.614	2.167	2.587
CRES	(PPB)	0.002	0.018	0.018	0.016	0.015	0.013	0.012
DIAL	(PPB)	0.003	0.095	0.079	0.047	0.027	0.017	0.013
MGLY	(PPB)	0.003	0.072	0.056	0.031	0.018	0.013	0.010
HO2	(PPB)	0.007	0.022	0.021	0.010	0.008	0.007	0.006
RO2S	ug/m^3)	0.010	0.042	0.107	0.169	0.207	0.202	0.183
RO2L	(ug/m^3)	0.010	0.011	0.031	0.073	0.090	0.087	0.081
RAO2	ug/m^3)	0.010	0.043	0.129	0.465	0.636	0.609	0.583
XO2	ug/m^3)	0.010	0.000	0.001	0.006	0.008	0.008	0.008
RCO3	ug/m^3)	0.010	0.012	0.061	0.301	0.355	0.325	0.271
NH3	(PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	(ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 31

SARMAP RUN 18 JULY 1984 (RUN A)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
[illegible]	PPB	2.201	2.219	2.177	2.161	2.150	2.143	2.133
SO2	ug/m 3)	17.000	17.129	17.300	17.400	17.400	17.443	17.500
NO	PPB)	5.623	2.137	0.261	0.000	0.000	0.000	0.000
NO2	PPB	7.494	6.297	1.328	0.003	0.021	0.019	0.019
O3	PPB	37.514	81.343	88.043	88.214	89.486	88.057	87.043
H2O2	PPB)	0.937	0.907	1.199	1.841	1.799	1.736	1.684
HNO3	PPB)	0.362	2.174	3.279	3.356	3.346	3.337	3.321
PAN1	PPB)	0.002	1.919	5.440	6.586	6.564	6.594	6.634
PAN2	PPB)	0.002	0.400	1.463	1.880	1.901	1.897	1.879
C3H8	PPB)	2.813	2.760	2.700	2.676	2.661	2.646	2.633
ALKA	PPB)	69.171	65.214	60.771	59.043	57.943	56.986	56.229
ETHE	PPB)	1.874	1.609	1.334	1.230	1.161	1.103	1.056
ALKE	PPB)	4.313	2.187	0.889	0.467	0.267	0.155	0.094
AROM	PPB)	9.751	7.544	5.529	4.874	4.493	4.174	3.941
HCHO	PPB)	6.561	7.963	7.976	5.990	4.310	3.200	2.483
ALD2	PPB)	7.687	10.571	11.929	11.343	10.340	9.489	8.893
KET	PPB)	17.614	18.914	20.329	20.457	20.229	20.029	19.843
HONO	PPB)	0.005	0.053	0.011	0.000	0.000	0.000	0.000
RNO3	PPB)	0.002	0.808	1.703	1.881	1.870	1.857	1.847
ROOH	PPB)	0.004	0.015	0.217	2.156	4.584	6.339	7.513
CRES	PPB)	0.002	0.235	0.277	0.274	0.272	0.266	0.261
DIAL	PPB)	0.003	1.271	1.579	1.122	0.707	0.457	0.312
MGLY	PPB)	0.003	0.901	1.106	0.676	0.363	0.209	0.132
HO2	PPB)	0.007	0.009	0.039	0.012	0.004	0.002	0.001
RO2S	ug/m 3)	0.010	0.017	0.086	0.459	0.511	0.496	0.461
RO2L	ug/m^3)	0.010	0.009	0.044	0.424	0.977	1.510	1.943
RAO2	ug/m^3)	0.010	0.013	0.073	0.993	2.643	4.321	5.721
KO2	ug/m 3)	0.010	0.001	0.004	0.052	0.140	0.231	0.306
RCO3	ug/m^3)	0.010	0.006	0.037	2.010	4.659	6.706	8.297
NH3	PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	ug/m 3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 32

SARNIA RUN 18 JULY 1984 (RUN B)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	PPB)	2.251	2.223	2.187	2.137	2.107	2.090	2.080
SO4	ug/m^3)	17.000	17.100	17.257	17.443	17.600	17.643	17.700
NO	PPB)	8.443	4.866	2.421	0.623	0.025	0.001	0.000
NO2	PPB)	11.257	11.119	7.867	3.103	0.206	0.031	0.027
O3	PPB)	37.514	50.586	71.471	94.571	104.286	103.414	102.386
H2O2	PPB)	0.937	0.894	0.852	0.916	1.517	1.606	1.539
HNO3	PPB)	0.562	2.520	4.676	6.616	6.996	6.983	6.969
PAN1	PPB)	0.002	0.998	3.096	6.299	8.494	8.667	8.719
PAN2	PPB)	0.002	0.191	0.808	1.716	2.293	2.333	2.319
C3H8	PPB)	2.063	2.030	1.990	1.937	1.901	1.883	1.871
ALKA	PPB)	51.957	49.643	46.414	42.571	40.114	39.014	38.229
ETHE	PPB)	1.406	1.247	1.046	0.835	0.710	0.656	0.616
ALKE	PPB)	3.186	1.834	0.823	0.289	0.113	0.057	0.030
AROM	PPB)	7.319	5.994	4.467	3.067	2.356	2.094	1.916
HCHO	PPB)	4.876	5.691	6.261	6.181	5.039	3.639	2.751
ALD2	PPB)	5.726	7.579	8.816	9.203	8.751	7.786	7.060
KET	PPB)	13.214	13.957	15.014	16.200	16.757	16.629	16.443
HONO	PPB)	0.005	0.094	0.068	0.026	0.002	0.000	0.000
RNO3	PPB)	0.002	0.475	1.140	1.891	2.264	2.266	2.250
ROOH	PPB)	0.004	0.005	0.011	0.078	0.972	2.873	4.260
CRES	PPB)	0.002	0.155	0.210	0.178	0.150	0.141	0.134
DIAL	PPB)	0.003	0.805	1.179	1.130	0.833	0.523	0.342
MGLY	PPB)	0.003	0.560	0.828	0.819	0.576	0.325	0.198
HCL	PPB)	0.007	0.003	0.007	0.024	0.027	0.005	0.002
RO2S	ug/m^3)	0.010	0.005	0.011	0.043	0.265	0.436	0.423
RO2L	ug/m^3)	0.010	0.002	0.006	0.021	0.187	0.635	0.975
RAD2	ug/m^3)	0.010	0.003	0.009	0.040	0.483	1.917	3.156
NO2	ug/m^3)	0.010	0.000	0.000	0.002	0.030	0.124	0.206
RCO3	ug/m^3)	0.010	0.002	0.005	0.021	0.753	3.196	4.824
NH3	PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 33

SARMAP RUN 18 JULY 1984 (RUN C)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
[illegible]	PPB)	2.231	2.230	2.197	2.154	2.116	2.099	2.087
SO4	ug/m^3)	17.000	17.100	17.214	17.366	17.543	17.600	17.671
NO	PPB)	11.229	7.096	3.904	1.491	0.299	0.001	0.001
NO2	PPB)	16.807	16.371	12.929	7.096	1.482	0.031	0.035
O3	PPB)	37.514	52.386	75.371	101.971	123.143	125.714	124.429
HCO2	PPB)	0.937	0.696	0.852	0.839	1.239	1.700	1.673
HNO3	PPB)	0.562	3.010	6.094	8.801	10.024	10.101	10.077
PAN1	PPB)	0.002	1.143	3.489	7.107	11.043	12.186	12.214
PAN2	PPB)	0.002	0.205	0.881	1.930	2.956	3.250	3.246
C3H8	PPB)	2.813	2.780	2.730	2.669	2.607	2.581	2.563
ALKA	PPB)	69.171	66.543	62.900	58.486	54.357	52.557	51.586
ETHE	PPB)	1.874	1.691	1.459	1.201	0.987	0.896	0.843
ALKE	PPB)	4.313	2.603	1.253	0.477	0.160	0.069	0.033
AROM	PPB)	9.751	8.230	6.431	4.687	3.401	2.936	2.707
HCHO	PPB)	6.561	7.379	7.944	7.894	7.013	5.324	4.031
ALD2	PPB)	7.687	9.941	11.571	12.229	12.129	11.166	10.209
KET	PPB)	17.614	18.457	19.600	20.986	22.171	22.271	22.043
HCNO	PPB)	0.005	0.116	0.091	0.049	0.009	0.000	0.000
RNO3	PPB)	0.002	0.543	1.306	2.214	2.983	3.131	3.111
ROOH	PPB)	0.004	0.004	0.008	0.029	0.388	2.173	4.021
ORES	PPB)	0.002	0.185	0.266	0.239	0.187	0.173	0.169
DIAL	PPB)	0.003	0.953	1.469	1.524	1.268	0.863	0.574
MGLY	PPB)	0.003	0.656	1.003	1.060	0.882	0.546	0.324
HO2	PPB)	0.007	0.002	0.005	0.013	0.036	0.013	0.003
ROOB	ug/m^3)	0.010	0.004	0.008	0.022	0.139	0.434	0.474
ROOL	ug/m^3)	0.010	0.002	0.004	0.011	0.068	0.468	0.918
RAD2	ug/m^3)	0.010	0.003	0.006	0.020	0.150	1.351	2.861
KOH	ug/m^3)	0.010	0.000	0.000	0.001	0.009	0.087	0.186
ROOT	ug/m^3)	0.010	0.001	0.004	0.010	0.124	2.331	4.827
NH3	PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 34

SAPRC-84 RUN 15 JULY 1984 (RUN D)

		10:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	2.231	2.231	2.203	2.167	2.126	2.077	2.039
SO4	(ug/m^3)	17.000	17.100	17.200	17.329	17.514	17.686	17.886
NO	(PPB)	11.229	8.143	5.976	3.853	2.104	0.887	0.276
NO2	(PPB)	14.986	15.271	13.400	10.697	7.404	4.089	1.697
O3	(PPB)	37.514	42.900	53.000	65.571	79.586	93.486	103.429
HCO2	(PPB)	1.879	1.794	1.701	1.600	1.506	1.451	1.564
HNO3	(PPB)	0.562	2.514	5.081	7.853	10.343	12.086	12.886
PAN1	(PPB)	0.002	0.465	1.336	2.633	4.327	6.306	7.987
PAN2	(PPB)	0.002	0.080	0.329	0.717	1.164	1.580	1.859
C3H8	(PPB)	1.407	1.391	1.370	1.344	1.311	1.274	1.246
ALKA	(PPB)	34.643	33.514	31.866	29.929	27.700	25.386	23.543
ETHE	(PPB)	0.937	0.857	0.753	0.638	0.522	0.416	0.341
ALKE	(PPB)	2.157	1.384	0.758	0.355	0.141	0.050	0.018
AROM	(PPB)	4.873	4.201	3.390	2.573	1.841	1.265	0.912
HCHO	(PPB)	3.281	3.634	3.994	4.211	4.261	4.156	3.844
ALD2	(PPB)	3.846	4.870	5.659	6.079	6.171	6.049	5.823
KET	(PPB)	8.814	9.164	9.666	10.284	10.986	11.657	12.157
HONO	(PPB)	0.005	0.113	0.112	0.094	0.066	0.034	0.012
RNO3	(PPB)	0.002	0.238	0.568	0.963	1.393	1.811	2.106
ROOH	(PPB)	0.004	0.004	0.004	0.006	0.010	0.034	0.189
CRES	(PPB)	0.002	0.085	0.134	0.137	0.111	0.078	0.056
DIAL	(PPB)	0.003	0.428	0.688	0.752	0.679	0.542	0.409
MGLY	(PPB)	0.003	0.292	0.464	0.516	0.482	0.401	0.306
HO2	(PPB)	0.007	0.001	0.002	0.003	0.005	0.013	0.022
RO2S	(ug/m^3)	0.010	0.001	0.003	0.004	0.009	0.023	0.071
RO2L	(ug/m^3)	0.010	0.001	0.001	0.002	0.004	0.008	0.024
RADI	(ug/m^3)	0.010	0.001	0.002	0.003	0.007	0.020	0.063
NO2	(ug/m^3)	0.010	0.000	0.000	0.000	0.000	0.001	0.005
RO3	(ug/m^3)	0.010	0.001	0.001	0.002	0.005	0.012	0.046
NH3	(PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	(ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

Run 35

Saturday Aug 18 Dec 1984 (Run E)

		11:00	11:00	12:00	13:00	14:00	15:00	16:00
SO2	(PPB)	2.231	2.231	2.207	2.176	2.144	2.111	2.080
SO4	(ug/m^3)	17.000	17.100	17.200	17.300	17.443	17.571	17.686
NO	(PPB)	6.361	6.451	5.740	4.859	3.941	3.106	2.433
NO2	(PPB)	5.391	6.287	7.521	6.743	7.987	5.289	4.730
O3	(PPB)	28.114	29.814	31.557	33.743	36.257	38.843	41.257
H2O2	(PPB)	0.937	0.897	0.851	0.804	0.757	0.716	0.681
HNO3	(PPB)	0.562	1.391	2.876	4.269	5.646	6.876	7.844
PAN1	(PPB)	0.002	0.024	0.090	0.208	0.373	0.563	0.743
PAN2	(PPB)	0.002	0.010	0.031	0.058	0.087	0.110	0.125
C3H6	(PPB)	4.687	4.640	4.574	4.496	4.410	4.326	4.253
ALKA	(PPB)	12.114	11.686	11.200	10.586	9.983	9.391	8.891
ETHE	(PPB)	0.008	0.008	0.007	0.006	0.005	0.004	0.004
ALKE	(PPB)	0.094	0.064	0.039	0.022	0.012	0.006	0.004
AROM	(PPB)	0.563	0.488	0.400	0.316	0.243	0.187	0.148
HCHO	(PPB)	0.939	0.803	0.770	0.823	0.919	1.017	1.090
ALD2	(PPB)	0.005	0.373	0.759	1.097	1.354	1.527	1.624
KET	(PPB)	0.003	0.183	0.418	0.684	0.959	1.217	1.427
HONO	(PPB)	0.005	0.081	0.091	0.092	0.084	0.070	0.052
RNO3	(PPB)	0.002	0.081	0.183	0.297	0.412	0.517	0.601
ROOH	(PPB)	0.004	0.004	0.004	0.004	0.004	0.004	0.004
ORA3	(PPB)	0.002	0.011	0.016	0.018	0.016	0.013	0.011
DIAL	(PPB)	0.003	0.051	0.078	0.080	0.079	0.067	0.055
MGLY	(PPB)	0.002	0.033	0.052	0.057	0.054	0.047	0.039
HCL	(PPB)	0.007	0.000	0.000	0.001	0.001	0.001	0.001
RDS	(ug/m^3)	0.110	0.000	0.001	0.001	0.001	0.002	0.002
RDL	(ug/m^3)	0.010	0.000	0.000	0.000	0.000	0.000	0.000
RAD2	(ug/m^3)	0.110	0.000	0.001	0.001	0.001	0.001	0.001
AD	(ug/m^3)	0.010	0.000	0.000	0.000	0.000	0.000	0.000
RDD3	(ug/m^3)	0.010	0.000	0.000	0.000	0.001	0.001	0.001
NH3	(PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	(ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010

BRANIA RUN 10 JULY 1987 (RUN F)

		10:00	11:00	12:00	13:00	14.00	15:00	16:00
SO2	(PPB)	2.201	2.241	2.230	2.213	2.199	2.186	2.174
SO4	(ug/m^3)	17.000	17.000	17.100	17.143	17.200	17.257	17.314
NO	(PPB)	11.229	12.629	12.314	11.829	11.214	10.557	9.871
NO2	(PPB)	18.743	16.157	15.114	14.129	13.371	12.857	12.700
O3	(PPB)	28.114	29.800	29.614	29.243	28.800	28.486	28.114
H2O2	(PPB)	0.937	0.903	0.866	0.829	0.793	0.762	0.737
HNO3	(PPB)	0.562	1.659	2.980	4.359	5.689	6.806	7.691
PAN1	(PPB)	0.002	0.008	0.020	0.037	0.058	0.079	0.096
PAN2	(PPB)	0.002	0.004	0.009	0.015	0.021	0.026	0.029
C3H6	(PPB)	2.344	2.331	2.314	2.296	2.279	2.260	2.246
ALKA	(PPB)	6.093	5.989	5.851	5.704	5.559	5.431	5.330
ETHE	(PPB)	0.006	0.006	0.006	0.007	0.007	0.006	0.006
ALKE	(PPB)	0.047	0.036	0.026	0.019	0.013	0.010	0.007
AROM	(PPB)	0.282	0.261	0.236	0.211	0.189	0.179	0.158
HCHO	(PPB)	0.469	0.401	0.361	0.348	0.349	0.354	0.355
ALD2	(PPB)	0.005	0.113	0.230	0.340	0.434	0.503	0.555
KET	(PPB)	0.003	0.052	0.114	0.180	0.245	0.301	0.344
HONO	(PPB)	0.005	0.087	0.100	0.105	0.101	0.089	0.072
RNO3	(PPB)	0.002	0.024	0.051	0.080	0.109	0.133	0.152
ROOH	(PPB)	0.004	0.004	0.004	0.004	0.004	0.004	0.004
CRES	(PPB)	0.002	0.004	0.007	0.008	0.009	0.009	0.009
DIAL	(PPB)	0.003	0.017	0.026	0.031	0.033	0.032	0.029
MGLY	(PPB)	0.003	0.012	0.017	0.019	0.019	0.018	0.016
PCO	(PPB)	0.007	0.000	0.000	0.000	0.000	0.000	0.000
RCO3	(ug/m^3)	0.010	0.000	0.000	0.000	0.000	0.000	0.000
RCO	(ug/m^3)	0.010	0.000	0.000	0.000	0.000	0.000	0.000
RNO2	(ug/m^3)	0.010	0.000	0.000	0.000	0.000	0.000	0.000
NO2	(ug/m^3)	0.010	0.000	0.000	0.000	0.000	0.000	0.000
RCO3	(ug/m^3)	0.010	0.000	0.000	0.000	0.000	0.000	0.000
NH3	(PPB)	0.013	0.013	0.013	0.013	0.013	0.013	0.013
DUST	(ug/m^3)	0.010	0.010	0.010	0.010	0.010	0.010	0.010